

Coso Monitoring Program
October 1996 Through September 1997

by
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Public Works Department

DECEMBER 1997

NAVAL AIR WEAPONS STATION
CHINA LAKE, CA 93555-6100



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FOREWORD

This report presents the status of the Coso Monitoring Program conducted for the period October 1996 through September 1997 by the Naval Air Weapons Station (NAWS), China Lake, Calif. The investigation, funded under the NAWS Coso Geothermal Development Program, is being conducted to provide baseline information on hydrology and surface geothermal activity in the Coso Hot Springs area.

This report was reviewed for technical accuracy by Allan M. Katzenstein and Steven C. Bjornstad (NAWS 83G000D).

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13. ABSTRACT (Maximum 200 words) (U) The Coso Monitoring Program is a continuing effort in support of the Navy's geothermal resources within the Coso Known Geothermal Resource Area (Coso KGRA). A substantial body of reports has been established on this project (15 technical publications) and the project is essentially the same year to year, therefore much of the text of each report reiterates previously published information. This year's report concentrates on data presentation and interpretation; the reader is referred to the 1993/1994 summary report (NAWS-CL TP 006) for detailed descriptions of the overall project and the individual sites monitored.				
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INTRODUCTION

The Coso Monitoring Program was initiated in 1978 to gather baseline data on the surface and near-surface geothermal activity at Devils Kitchen and Coso Hot Springs which are the main active thermal features within the Coso Known Geothermal Resource Area (Coso KGRA). These two sites are also located inside the boundaries of the Naval Air Weapons Station (NAWS), China Lake, Calif. This report represents the twentieth consecutive year of continuous data collection at these sites by Geothermal Program Office personnel.

The format of the report for the current reporting period hasn't been changed from last year's report. A substantial body of reports has been established on this project (15 technical publications) and the project is essentially the same year to year, therefore much of the text of each report reiterates previously published information. This year's report concentrates on data presentation and interpretation and the reader is referred to the 1993/1994 summary report (Reference 1) for detailed descriptions of the overall project and the individual sites monitored.

Seasonal and diurnal variations of the thermal activity in these hot spring areas continue to be evident. Overall, the level of activity has been very stable during this reporting period.

Monitoring sites of the Coso Hot Springs area and type of data collected at each site are presented in Table 1. The location of each site is shown in Figure 1.

TABLE 1. Monitoring Functions and Locations.

Monitored sites	Continuous steam flow	Wellhead pressure	Periodic water level	Periodic water temperature	Water level photography	Water chemistry	Ambient temperature	Barometric pressure	Relative humidity	Wind speed and direction
Schober's Resort (Wells 4A-2, 3)	X									
Well 4A-4			X ^a	X						
Well 4H-4	X									
Well 4P-1			X ^b	X		X				
Well 4H-8 (Coso No. 1)		X ^c		X						
Devils Kitchen	X					X				
Observation Well No. 1			X ^b	X		X				
Observation Well No. 2			X ^b							
South Pool			X ^b	X	X	X				
Weather Station							X	X	X	X

^aLess than weekly monitoring.^bWeekly monitoring.^cWeekly shut-in wellhead pressures.

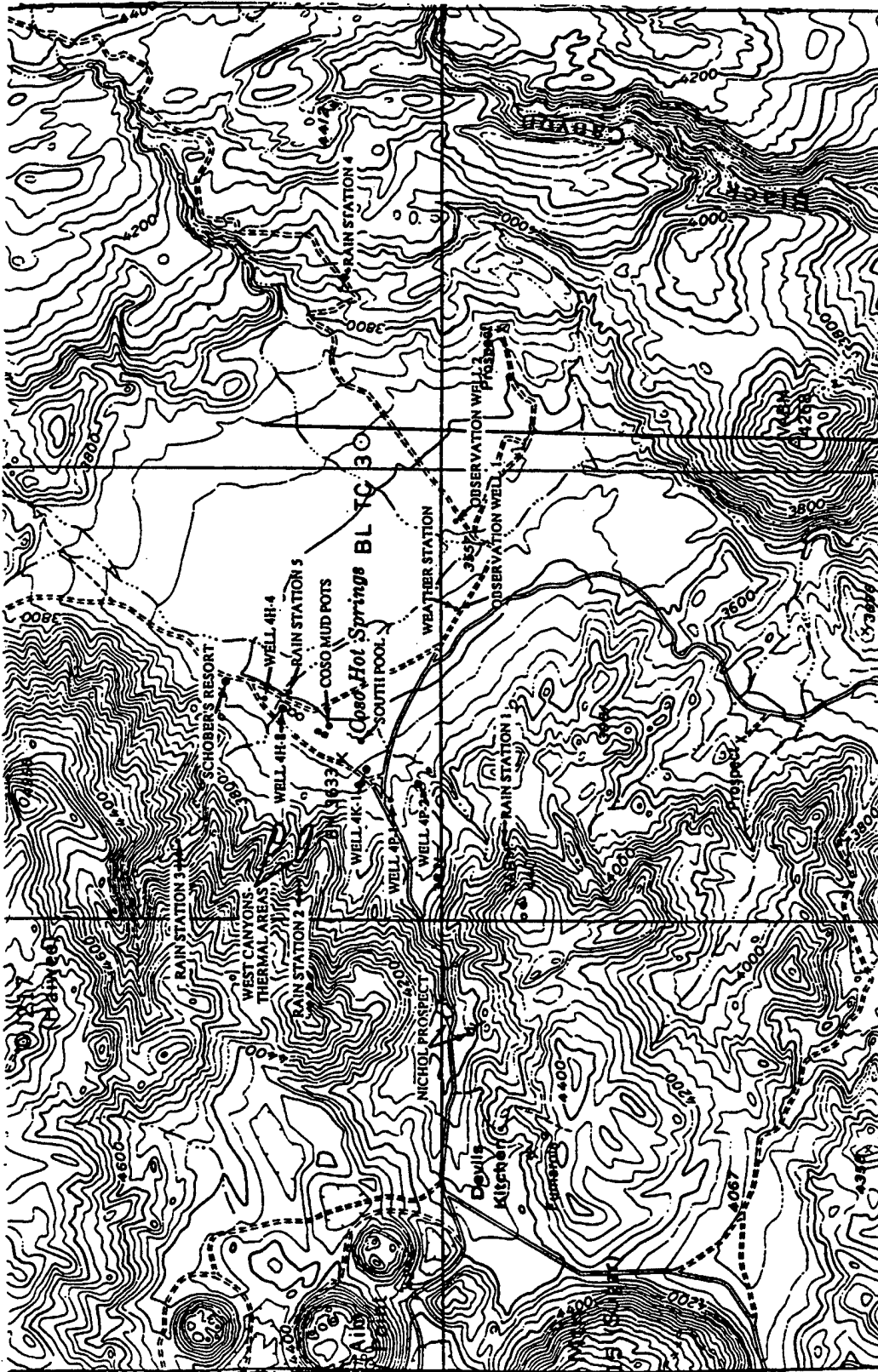


FIGURE 1. Coso Known Geothermal Resources Area Monitoring Sites.

STEAM FLOW AND TEMPERATURE MONITORING

Steam flow has been gauged at several shallow wells since the monitoring program was first initiated. While the measured steam flow from these wells represents an uncertain fraction of the total steam flow from the Coso thermal area, it does serve to monitor the relative hydrothermal activity in the area over time. Several sites are currently included in the study: Devils Kitchen, the Stove Pipe Eight-Inch Well (4H-4), and Schober's Resort (4A-2 and 3).

Steam flow data are recorded at each site using an ITT Barton differential pressure unit AdScan recorder. The data are down-loaded to a pocket-size flash memory card. The information stored in the flash memory card is then transferred into Paradox databases.

A periodic maintenance schedule was established in house to ensure that the recording units are maintained at peak efficiency and reliability. Additionally, a contract was established with ITT Barton for yearly maintenance and calibration of the Barton meter/AdScan units. The AdScan units and the Barton meters were calibrated on 17 April 1997. In August of 1997 the resistor pods, which send the electrical signal to the AdScan unit, were replaced in the Barton meters. Since replacing the resistor pods the AdScan meters have resumed their constant readings.

DEVILS KITCHEN

Steam flow at Devils Kitchen is monitored using a Barton 25-inch water column differential pressure unit (DPU) and AdScan recorder. Daily high, low, and average steam flow data collected at Devils Kitchen for the period of this report are presented in the Appendix. Figure 2 shows a summary graph of Devils Kitchen steam flow activity from October 1996 through September 1997. From late August 1997 through September 1997 the steam flow data recorded at Devils Kitchen (Figure 2) showed a marked increase. The increase does not appear to reflect an actual increase in the steam flow, but may be a mechanical problem in the AdScan recording unit. This situation is still being assessed.

STOVE PIPE EIGHT-INCH STEAM WELL (4H-4)

The daily steam flow for well 4H-4 is presented in the Appendix. This site is equipped with a 50-inch water column DPU and AdScan recorder. Figure 3 shows a summary graph of steam flow activity from October 1996 through September 1997. Data covering the period of 7-10 September 1997 were lost as the result of a data transfer error.

SCHOBERS WELLS (4A-2 AND 4A-3)

The daily steam flow for wells 4A-2 and 4A-3 at Schober's Resort are presented in the Appendix. This site is equipped with a 50-inch water column DPU and AdScan recorder. Figure 4 shows a summary graph of steam flow activity from October 1996 through 30 September 1997. Data covering the period of 20-26 November 1996 and 10-16 July 1997 were lost as a result of a data transfer error.

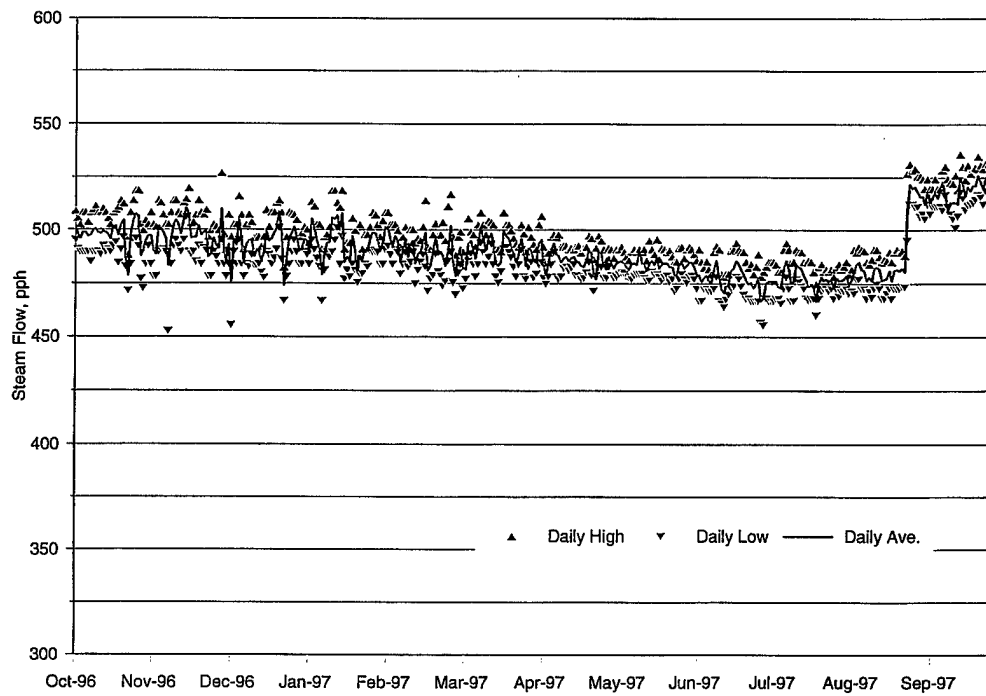


FIGURE 2. Devils Kitchen Steam Flow, October 1996 through September 1997.

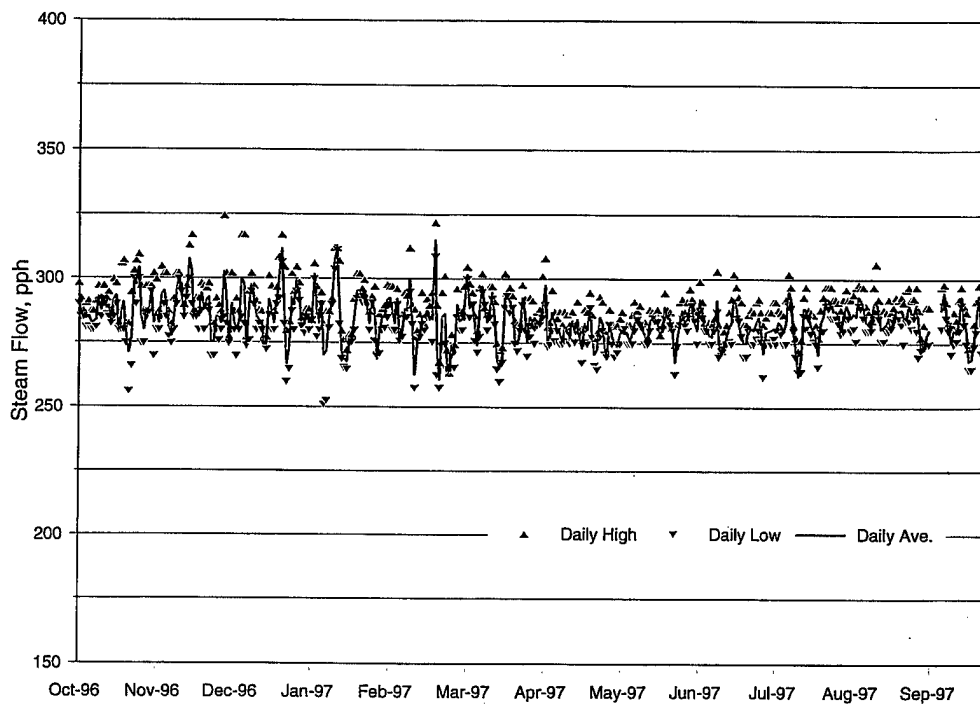


FIGURE 3. Well 4H-4 Steam Flow, October 1996 through September 1997.

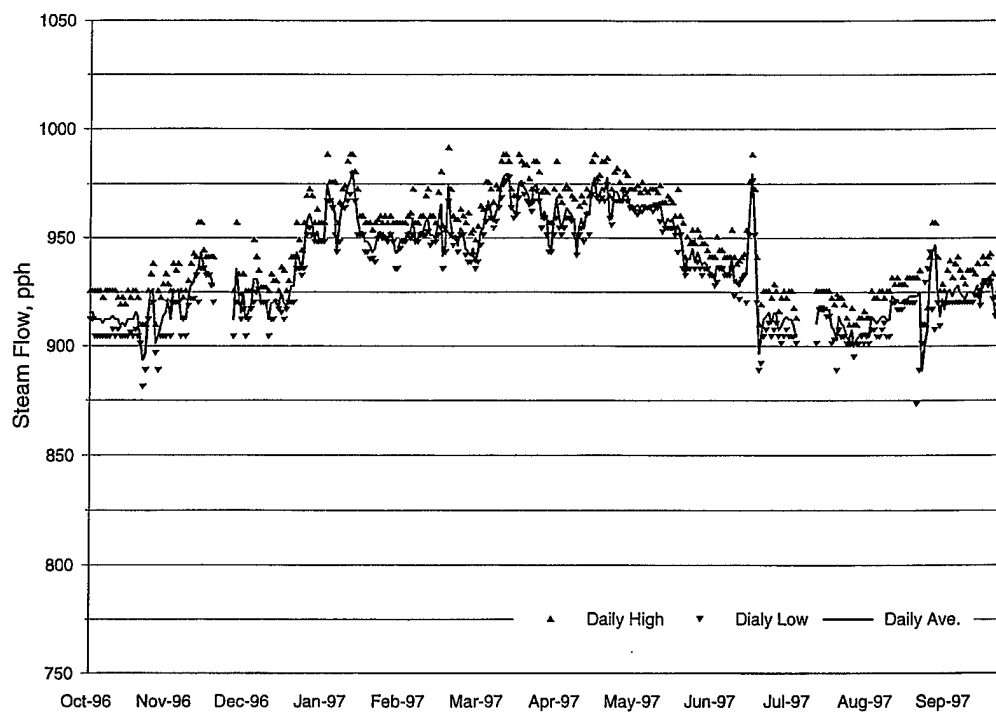


FIGURE 4. Wells 4A-2 and 4A-3 Steam Flow, October 1996 through September 1997.

COSO HOT SPRINGS MUDFIELD PHOTOGRAPHIC RECORD

A weekly photographic record was initiated in January 1978 to document the fluctuation in fluid levels in several of the more prominent mud pots in the Coso KGRA. Over the years the photo record has provided a clear picture of this hot springs thermal activity. It has demonstrated the sensitivity of the hot springs to both seasonal weather changes and individual weather events, such as summer thunderstorms. It has also chronicled the changes in thermal activity that occurred throughout the Coso Hot Springs area in the late 198s. This weekly photo record was continued through this reporting period and is catalogued and stored at the Geothermal Program Office.

Selected photographs, Figures 5 through 13, show the typical level of thermal activity in the hot springs area throughout the past year.



FIGURE 5. Resort Mud Pot Area, August 1997.

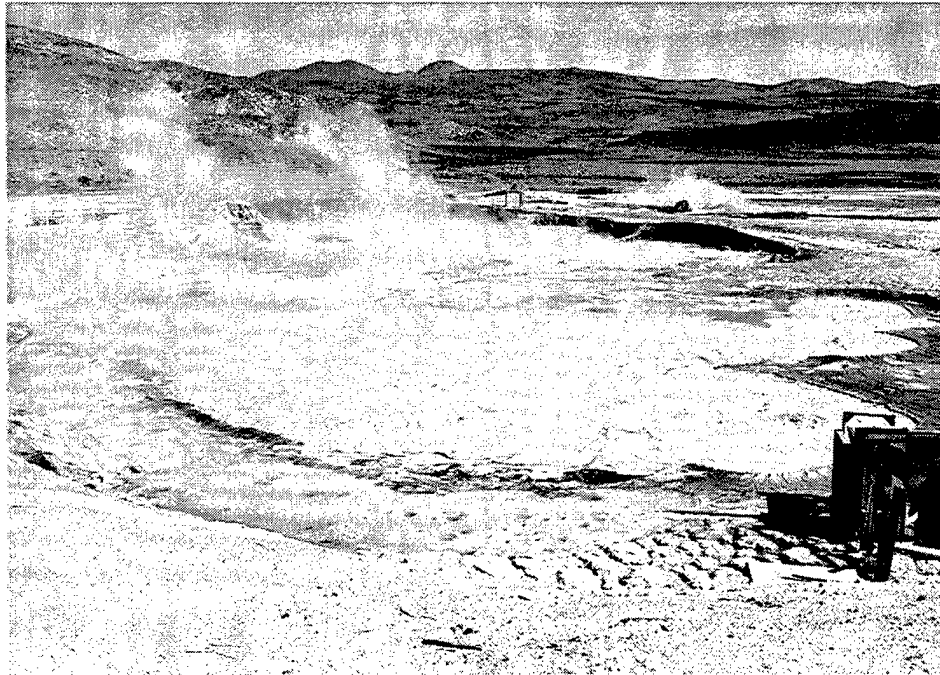


FIGURE 6. South Pool, High Water Level, May 1997.

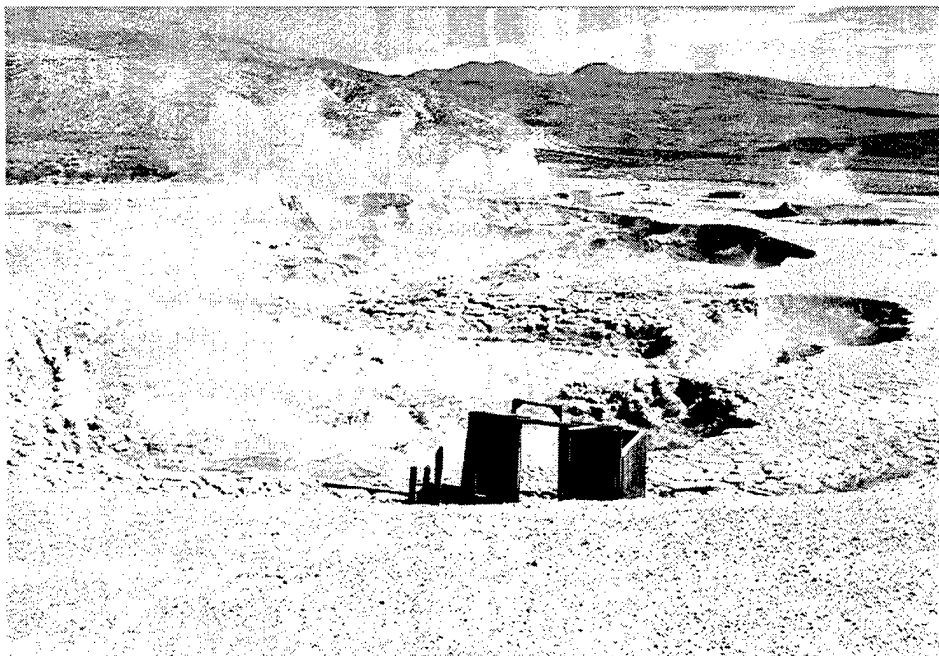


FIGURE 7. South Pool, Low Water Level, October 1996.

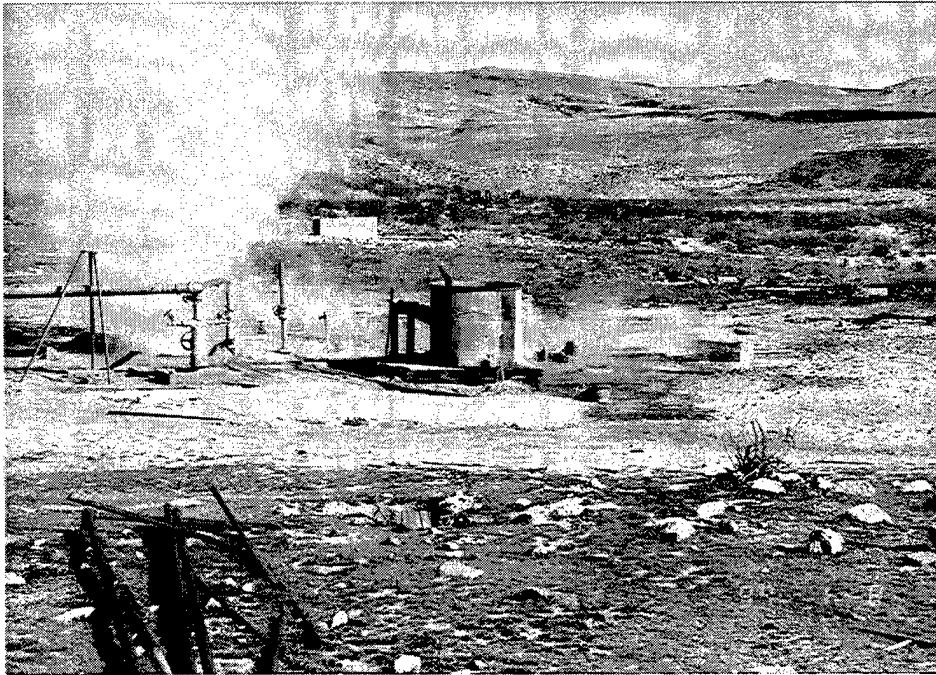


FIGURE 8. Schober's Resort Area.



FIGURE 9. West Canyon, Looking East Down Canyon, September 1997.

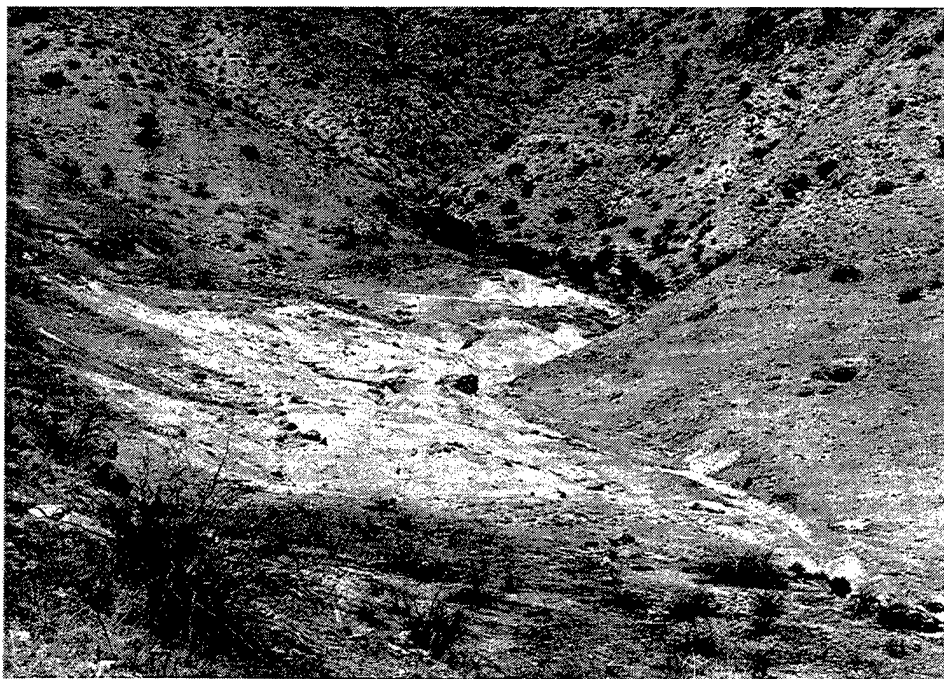


FIGURE 10. Northern West Canyon Land Slump, March 1997.

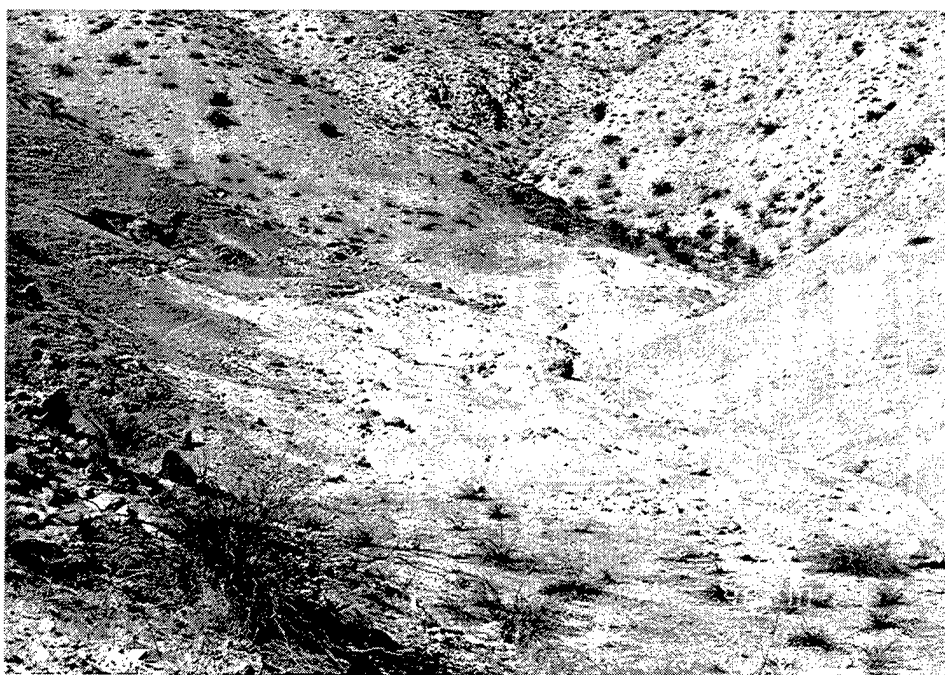


FIGURE 11. Northern West Canyon Land Slump, October 1997.

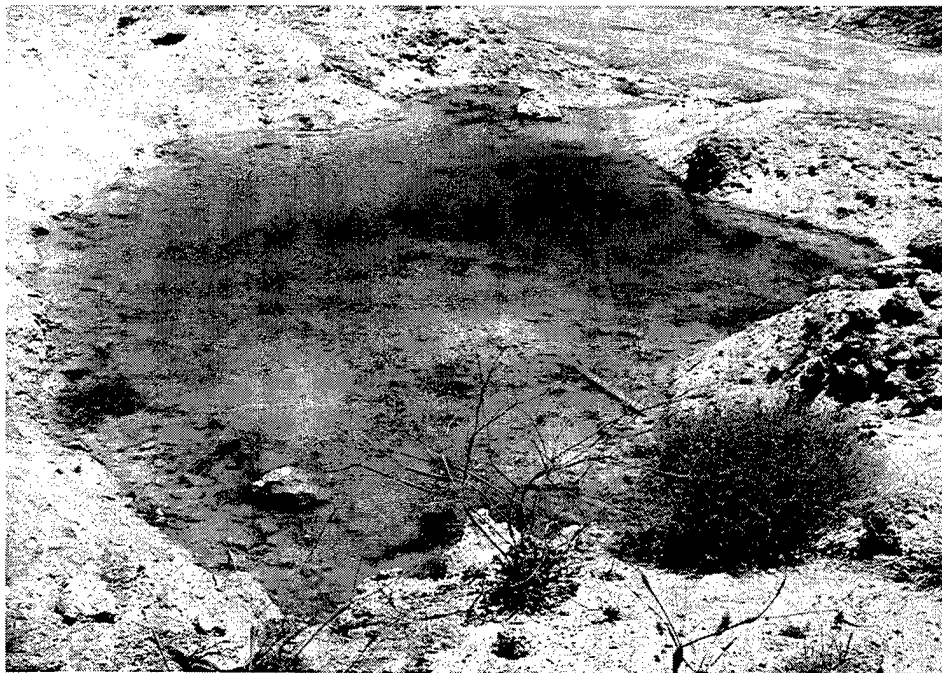


FIGURE 12. Nichol Prospect Warm Pool, March 1997.



FIGURE 13. Nichol Prospect Warm Pool, August 1997.

WATER LEVEL MONITORING

OBSERVATION WELLS

Groundwater levels are monitored in four wells. Bi-weekly measurements are taken at wells 4P-1, OB-1 and OB-2, while the water level of another well, Coso No. 1 (4H-8), is determined indirectly from temperature logs and weekly wellhead pressure readings. These level data are listed in Table 2. Figure 14 shows a summary graph of observation well water levels from 1980 to the present. Depth to water data have been translated to true elevation.

The fluid level elevation in well 4P-1 appears to have stabilized at 3613.3 feet above sea level (ASL) during this monitoring period. Well 4P-1 is a hot, steam condensate well and is located on the upthrown side of the Coso Hot Springs fault, about 150 feet from the fault line, toward the south end of the hot springs area. It is completed in alluvial fill material. As discussed in Reference 2, this well appears to tap a small perched aquifer that is not directly connected to the regional aquifer.

Observation wells OB-1 and OB-2 are water wells located in the Upper Coso Basin about three-quarters of a mile east of the fault line. Both of these wells are completed in sedimentary, valley fill material. The water level elevation in OB-1 continues the decline described in previous reports, dropping from about 3432 feet ASL in 1988 to about 3385.6 feet ASL by September 1997. The water level in OB-2, however, rose about 10 feet during 1989 and 1990. This level appears to have stabilized at about 3365.5 feet ASL.

Coso No. 1 is located toward the north end of the Coso Hot Springs fault and is completed in bedrock. The fluid level in Coso No. 1 declined slightly from 3473 to about 3465 feet ASL between 1978 and October 1987. At that lowered fluid level, the well began to boil. The fluid level dropped rapidly to about 3410 feet ASL by September 1988, and the wellbore became plugged with salt and scale. Coso No. 1 was rehabilitated in 1993 and shut-in to reduce boiling and scaling. The current fluid level (determined from the temperature gradient log) is at about 3294 feet ASL.

Shut-in wellhead pressures for Coso No. 1 are recorded weekly from both the 4-inch wellbore and the 7-inch intermediate casing around the wellbore. The wellbore is completed to 370 feet in bedrock, while the intermediate casing is set to 194 feet at the alluvium/ bedrock interface. Table 3 is a listing of the current year's recorded pressures. Figure 15 is a summary graph of these pressures from November 1993 to the present.

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TABLE 2. Observation Well Water Level Data.

Date	Water level elevations, ft, above mean sea level (AMSL)			
	Ground level at well location, ft, AMSL			Ground level, ft, AMSL
	4P-1	OB-1	OB-2	Coso 1
	3662.0	3570.0	3560.0	3615.0
	Water level measurements			Water level
	4P-1	OB-1	OB-2	Coso 1
2 Oct 96	3613.3	3385.6	3365.5	3294.0
9 Oct 96	3613.3	3385.6	3365.5	
16 Oct 96	3612.1	3385.6	3365.5	
23 Oct 96	3613.3	3385.6	3365.5	
30 Oct 96	3613.3	3386.8	3365.5	
6 Nov 96	3613.3	3386.8	3365.5	
13 Nov 96	3613.3	3386.8	3365.5	
20 Nov 96	3613.3	3386.8	3365.5	
27 Nov 96	3613.3	3386.8	3365.5	
4 Dec 96	3613.3	3386.8	3365.5	
11 Dec 96	3612.1	3387.9	3364.3	
18 Dec 96	3612.1	3385.6	3365.5	
26 Dec 96	3612.1	3385.6	3365.5	
2 Jan 97	3612.1	3385.6	3365.5	
8 Jan 97	3612.1	3385.6	3365.5	
16 Jan 97	3612.1	3385.6	3365.5	
23 Jan 97	3612.1	3385.6	3365.5	
5 Feb 97	3613.3	3384.5	3365.5	
12 Feb 97	3612.1	3385.6	3365.5	
19 Feb 97	3612.1	3384.5	3364.3	
26 Feb 97	3613.3	3385.6	3364.3	
5 Mar 97	3613.3	3384.5	3365.5	
12 Mar 97	3612.1	3386.8	3365.5	
19 Mar 97	3614.5	3383.8	3364.3	
26 Mar 97	3613.3	3384.5	3365.5	
2 Apr 97	3612.1	3385.6	3365.5	
9 Apr 97	3612.1	3385.6	3365.5	
17 Apr 97	3613.3	3384.5	3365.5	
24 Apr 97	3613.3	3385.6	3365.5	
30 Apr 97	3613.3	3385.6	3365.5	

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TABLE 2. (Contd.)

Date	Water level elevations, ft, AMSL			
	Ground level at well location, ft, AMSL			Ground level, ft, AMSL
	4P-1	OB-1	OB-2	Coso 1
	3662.0	3570.0	3560.0	3615.0
	Water level measurements			Water level
	4P-1	OB-1	OB-2	Coso 1
7 May 97	3613.3	3385.6	3365.5	
14 May 97	3613.3	3385.6	3365.5	
21 May 97	3613.3	3385.6	3365.5	
28 May 97	3613.3	3385.6	3365.5	
4 Jun 97	3613.3	3385.6	3365.5	
11 Jun 97	3613.3	3385.6	3364.3	
18 Jun 97	3613.3	3385.6	3364.3	
25 Jun 97	3613.3	3385.6	3364.3	
2 Jul 97	3613.3	3384.5	3365.5	
9 Jul 97	3613.3	3385.6	3365.5	
16 Jul 97	3613.3	3385.6	3365.5	
23 Jul 97	3613.3	3385.6	3364.3	
30 Jul 97	3613.3	3385.6	3364.3	
6 Aug 97	3613.3	3385.6	3364.3	
13 Aug 97	3613.3	3385.6	3365.5	
20 Aug 97	3613.3	3385.6	3365.5	
27 Aug 97	3613.3	3385.6	3365.5	
3 Sep 97	3613.3	3385.6	3365.5	
10 Sep 97	3613.3	3385.6	3365.5	
17 Sep 97	3613.3	3385.6	3365.5	
24 Sep 97	3613.3	3385.6	3365.5	

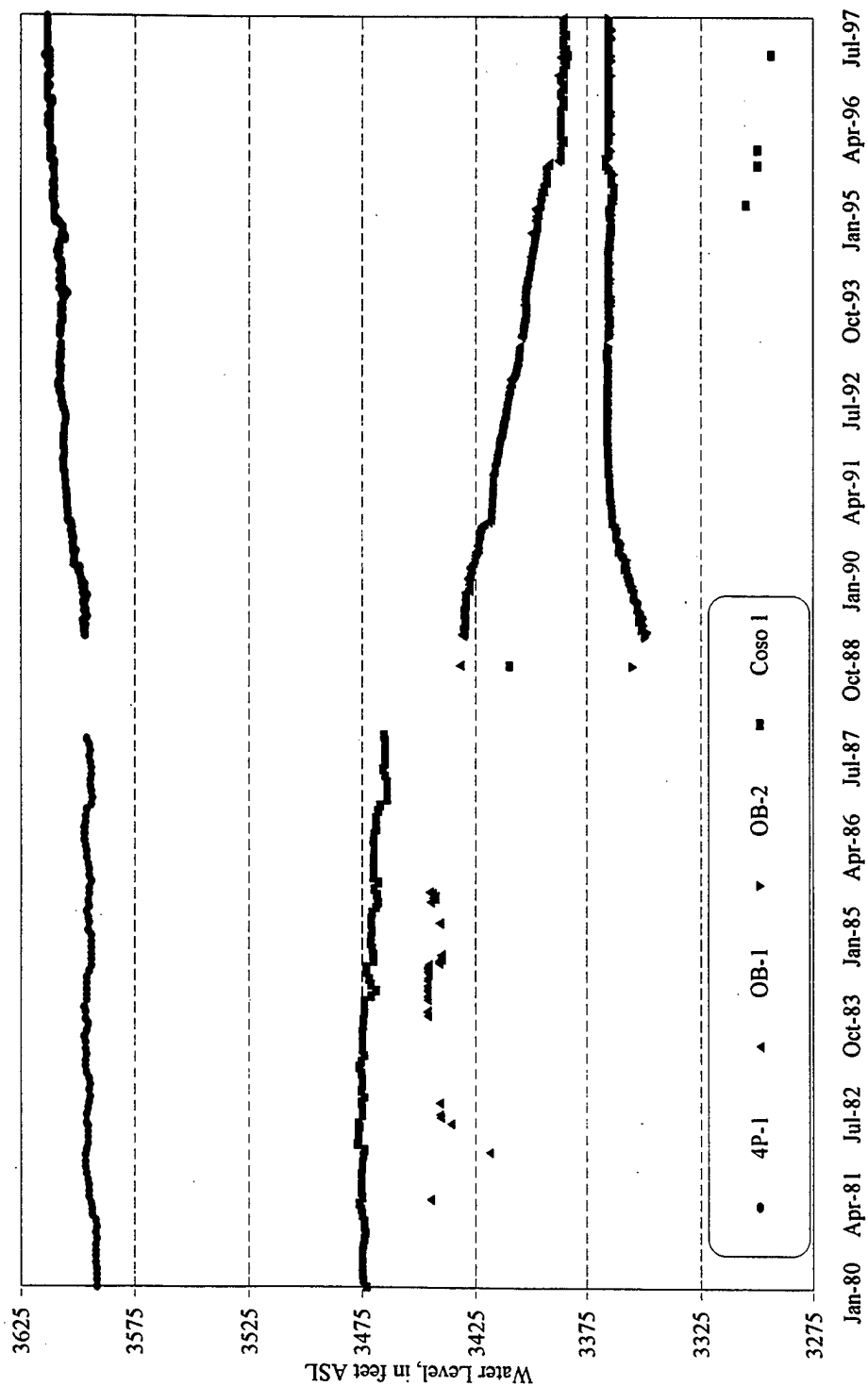


FIGURE 14. Water Levels in Coso Observation Wells, January 1980 Through September 1997.

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TABLE 3. Shut-in Wellhead Pressure, Coso No. 1.

Date	7-inch Casing (psig)	4-inch Casing (psig)
2 Oct 96	24.5	20.5
9 Oct 96	24.5	20.5
16 Oct 96	25.0	20.5
23 Oct 96	24.5	20.5
30 Oct 96	24.5	20.5
6 Nov 96	24.5	20.5
13 Nov 96	25.0	20.5
20 Nov 96	24.5	20.5
27 Nov 96	24.5	20.5
4 Dec 96	24.5	20.5
11 Dec 96	24.5	20.5
18 Dec 96	24.5	20.5
26 Dec 96	25.0	20.5
2 Jan 97	24.5	20.5
8 Jan 97	24.5	20.5
16 Jan 97	24.5	20.5
23 Jan 97	25.0	20.5
5 Feb 97	25.0	20.5
12 Feb 97	25.0	20.5
19 Feb 97	25.0	20.5
26 Feb 97	24.5	20.5
5 Mar 97	24.5	20.5
12 Mar 97	25.0	20.5
19 Mar 97	25.0	20.5
26 Mar 97	25.0	20.5
2 Apr 97	25.0	20.5
9 Apr 97	25.0	20.5
17 Apr 97	25.0	20.5
24 Apr 97	24.5	20.5
30 Apr 97	25.0	20.5
7 May 97	25.0	20.5
14 May 97	25.0	21.0
21 May 97	25.5	21.0
28 May 97	25.5	21.0
4 Jun 97	25.5	21.0
11 Jun 97	25.5	21.0
18 Jun 97	25.5	21.0
25 Jun 97	25.5	21.0
2 Jul 97	25.5	21.0
9 Jul 97	25.5	21.0
16 Jul 97	25.5	21.0
23 Jul 97	25.5	21.0
30 Jul 97	25.5	21.0
6 Aug 97	25.0	20.5
13 Aug 97	25.0	21.5
20 Aug 97	25.0	21.5
27 Aug 97	25.0	21.5
3 Sep 97	25.0	21.5
10 Sep 97	25.5	21.0
17 Sep 97	25.5	21.0
24 Sep 97	25.5	21.0

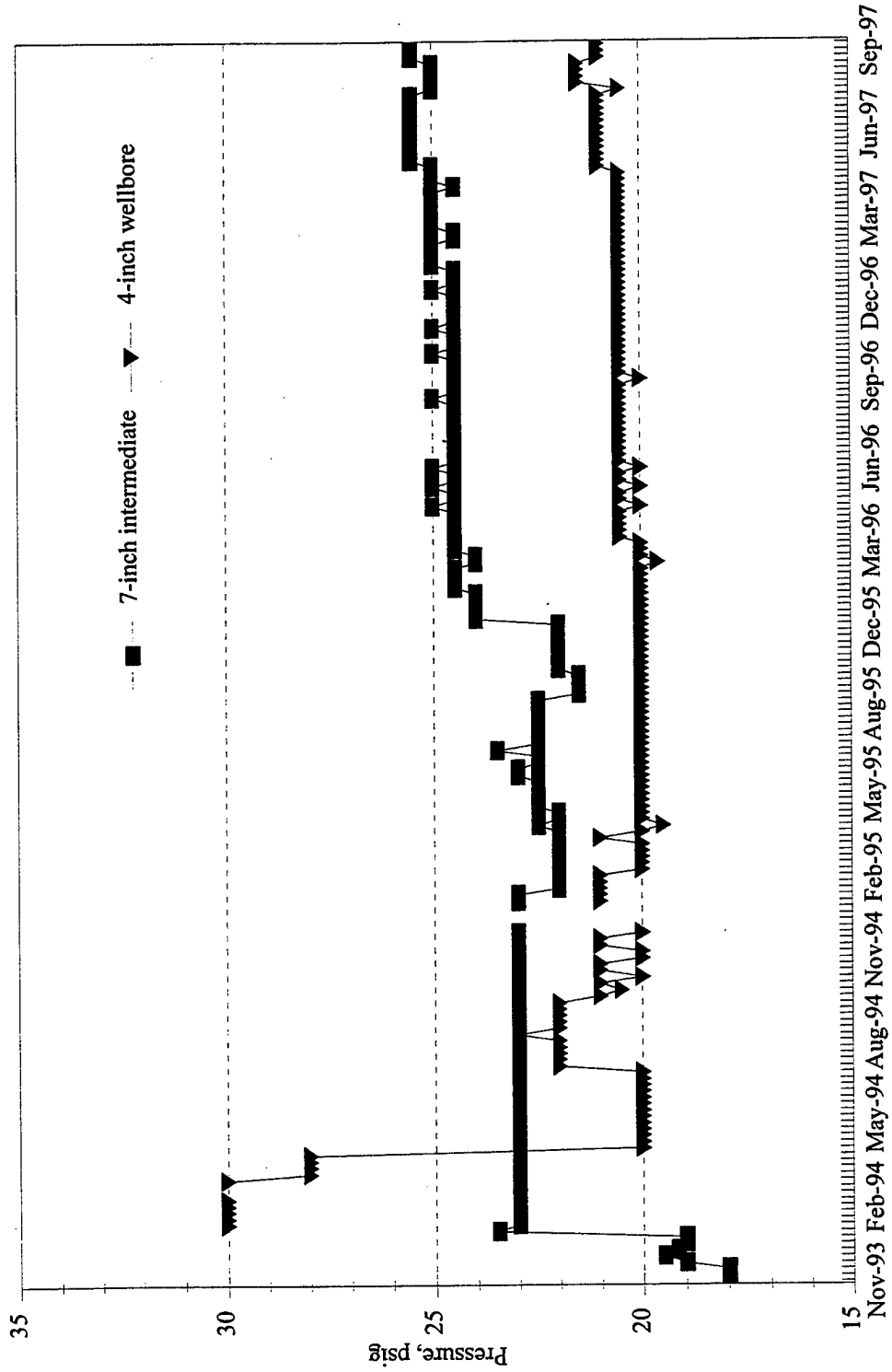


FIGURE 15. Shut-in Wellhead Pressure, Coso Well No. 1, November 1993 to September 1997.

SOUTH POOL

The South Pool water level has continued the pattern of seasonal fluctuations throughout this reporting period, ranging from a low of 3612.2 feet in October 1996 to a high of 3620.7 feet in February of 1997 (Table 4). The pool's temperature is periodically measured, as conditions permit. Water temperatures for this period continued to average above 200 degrees Fahrenheit. The temperature and water elevations of the pool for January 1988 through September 1997, the period of increased activity, are shown graphically in Figure 16, while the pool elevation recorded for the entire monitoring program period is shown in Figure 17.

TABLE 4. South Pool Elevation and Temperature Changes.

Date	Elevation ft	Temperature °F	Date	Elevation ft	Temperature °F
2 Oct 96	3616.5	212	9 Apr 97	3620.3	206
9 Oct 96	3616.7	210	17 Apr 97	3620.3	205
16 Oct 96	3616.9	211	24 Apr 97	3620.2	204
23 Oct 96	3617.2	210	30 Apr 97	3620.0	205
30 Oct 96	3617.6	211	7 May 97	3619.8	206
6 Nov 96	3617.9	209	14 May 97	3619.6	204
13 Nov 96	3618.4	206	21 May 97	3619.6	205
20 Nov 96	3618.6	207	28 May 97	3619.8	205
27 Nov 96	3618.7	205	4 Jun 97	3618.5	206
4 Dec 96	3619.3	202	11 Jun 97	3618.4	204
11 Dec 96	3619.3	204	18 Jun 97	no data	193
18 Dec 96	3619.5	204	25 Jun 97	no data	194
26 Dec 96	3619.6	208	2 Jul 97	6318.5	no data
2 Jan 97	3619.5	204	9 Jul 97	6318.5	no data
8 Jan 97	3619.5	210	16 Jul 97	no data	no data
16 Jan 97	3620.1	202	23 Jul 97	3618.4	212
23 Jan 97	3620.3	206	30 Jul 97	3618.4	212
5 Feb 97	3620.4	205	6 Aug 97	3618.2	212
12 Feb 97	3620.3	210	13 Aug 97	3618.0	213
19 Feb 97	3620.4	207	20 Aug 97	3617.9	211
26 Feb 97	3620.7	205	27 Aug 97	3617.8	no data
5 Mar 97	3620.6	208	3 Sep 97	3617.9	210
12 Mar 97	3620.4	210	10 Sep 97	3617.7	211
19 Mar 97	3620.4	205	17 Sep 97	3617.7	211
26 Mar 97	3620.3	201	24 Sep 97	3617.8	211
2 Apr 97	3620.4	204			

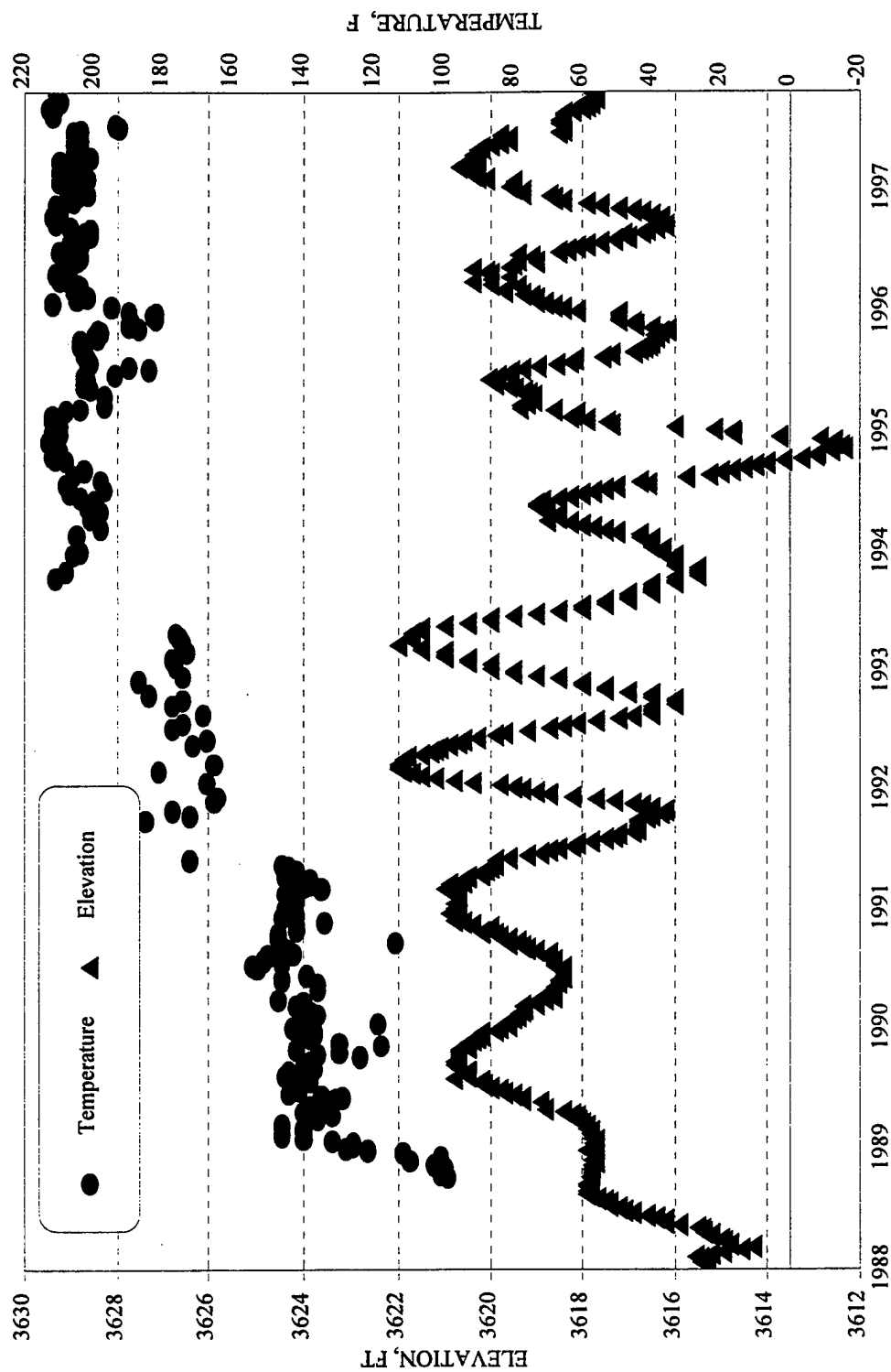


FIGURE 16. South Pool Elevation and Temperature, January 1988 Through September 1997.

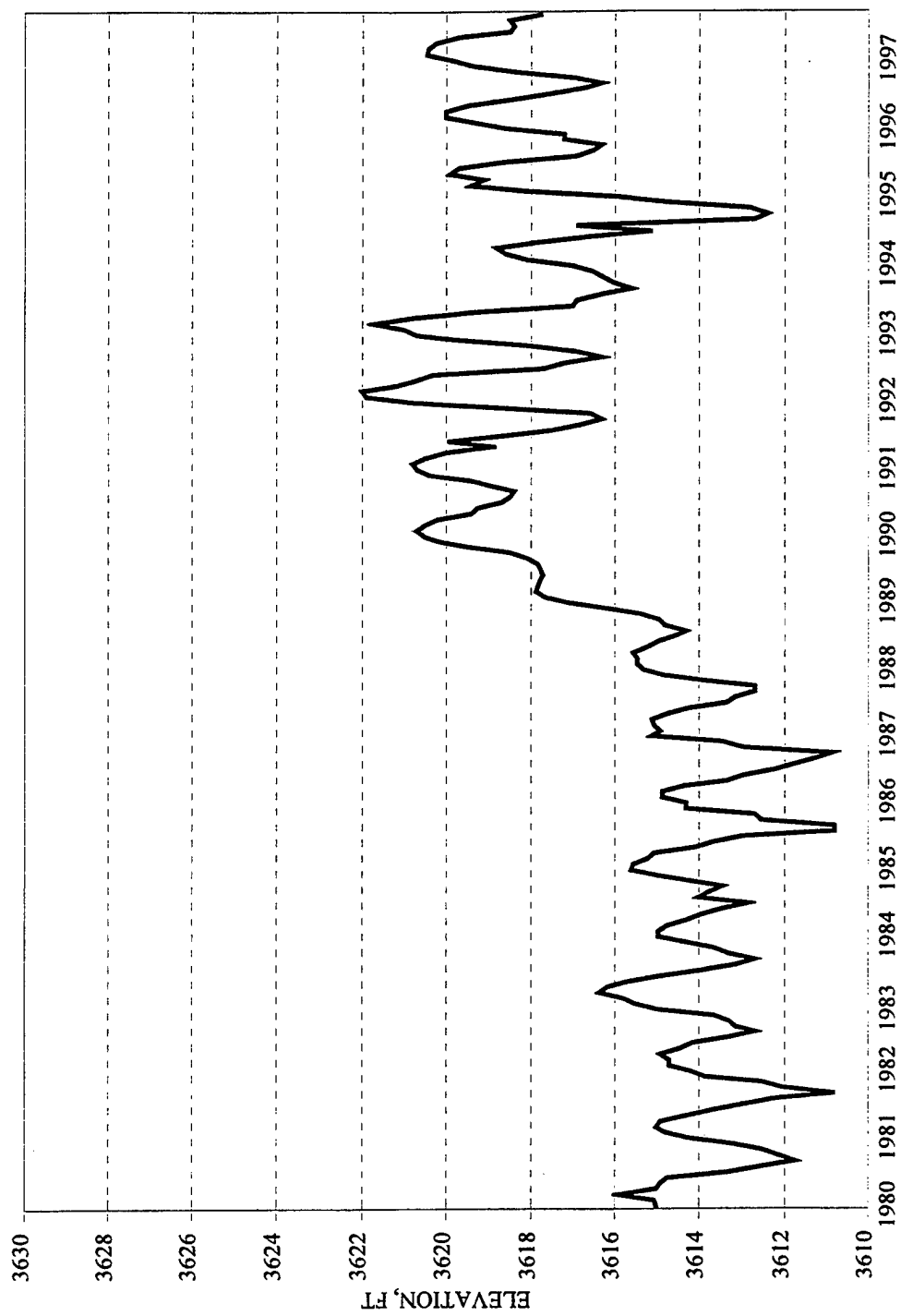


FIGURE 17. South Pool Elevations, 1980 Through September 1997.

RAINFALL AT COSO RESORT AREA AND ROSE VALLEY

Rainfall in the Coso Hot Springs basin is monitored at five rain station sites, as mapped in Figure 1. Instrumentation at each site consists of a battery-operated long-term strip recorder that is triggered by a tipping bucket. No rain data were recorded in tipping buckets 2 and 3 for the months of June 1997 and September 1997 due to mechanical problems. The Rose Valley data are collected at the Los Angeles Department of Water and Power Haiwee Reservoir Plant.

Data from the Coso rain stations and the Rose Valley data from the Haiwee power plant are presented in Table 5 and Figure 18. Comparative rainfall data for Coso Basin, Rose Valley, and the Indian Wells Valley (IWV) for the period 1966 through 1996 are shown in Table 6 and Figure 19. IWV data were gathered at Armitage Field, Naval Air Warfare Center Weapons Division (NAWCWPNS), and provided by a NAWCWPNS meteorologist.

TABLE 5. Rainfall Recorded at the Coso Rain Stations and Rose Valley.

Coso Hot Springs area						Rose Valley	
Date	Tipping bucket stations (rainfall, in.)					Date	Rainfall, in.
	1	2	3	4	5		
21 Nov 96						30 Oct 96	0.15
						31 Oct 96	0.25
					0.04	22 Nov 96	0.56
9 Dec 96	0.63	0.43	0.32	0.38	0.10		
10 Dec 96	0.03					10 Dec 96	0.39
11 Dec 96	0.10	0.11	0.09		0.02	11 Dec 96	0.26
						12 Dec 96	0.07
22 Dec 96	0.32	0.23	0.19	0.21	0.06	22 Dec 96	0.23
						23 Dec 96	0.4
25 Dec 96				0.08			
27 Dec 96	0.03	0.60	0.80		0.04	27 Dec 96	0.2
						28 Dec 96	0.02
30 Dec 96	0.04	0.70	0.90		0.08		
31 Dec 96	0.01						
						1 Jan 97	0.03
2 Jan 97	0.02					2 Jan 97	0.23
6 Jan 97	0.04						
						13 Jan 97	0.12
15 Jan 97	0.02	0.80	0.12		0.05	15 Jan 97	0.15
16 Jan 97	0.05						
						21 Jan 97	0.02
22 Jan 97					0.02		

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TABLE 5. (Contd.)

Coso Hot Springs area						Rose Valley	
Date	Tipping bucket stations (rainfall, in.)					Date	Rainfall, in.
	1	2	3	4	5		
23 Jan 97	0.02					23 Jan 97	0.04
24 Jan 97		0.10	0.11				
25 Jan 97					0.11		
26 Jan 97	0.11					26 Jan 97	0.21
18 May 97					0.01		
						19 May 97	0.05
20 May 97	0.01						
5 Jun 97				0.28	0.32		
						6 Jun 97	0.38
7 Jun 97	0.14						
13 Jun 97				0.08	0.09		
15 Jun 97	0.11			0.10	0.02	15 Jun 97	0.22
16 Jun 97	0.13						
22 Jul 97	0.14			0.18	0.16		
						23 Jul 97	0.63
28 Jul 97					0.03		
						29 Jul 97	0.16
2 Sep 97	0.09			0.05	0.08	2 Sep 97	0.67
25 Sep 97	1.05			1.38	1.44	25 Sep 97	0.45
						26 Sep 97	1.48
TOTAL	3.09	2.97	2.53	2.74	2.67	TOTAL	7.37

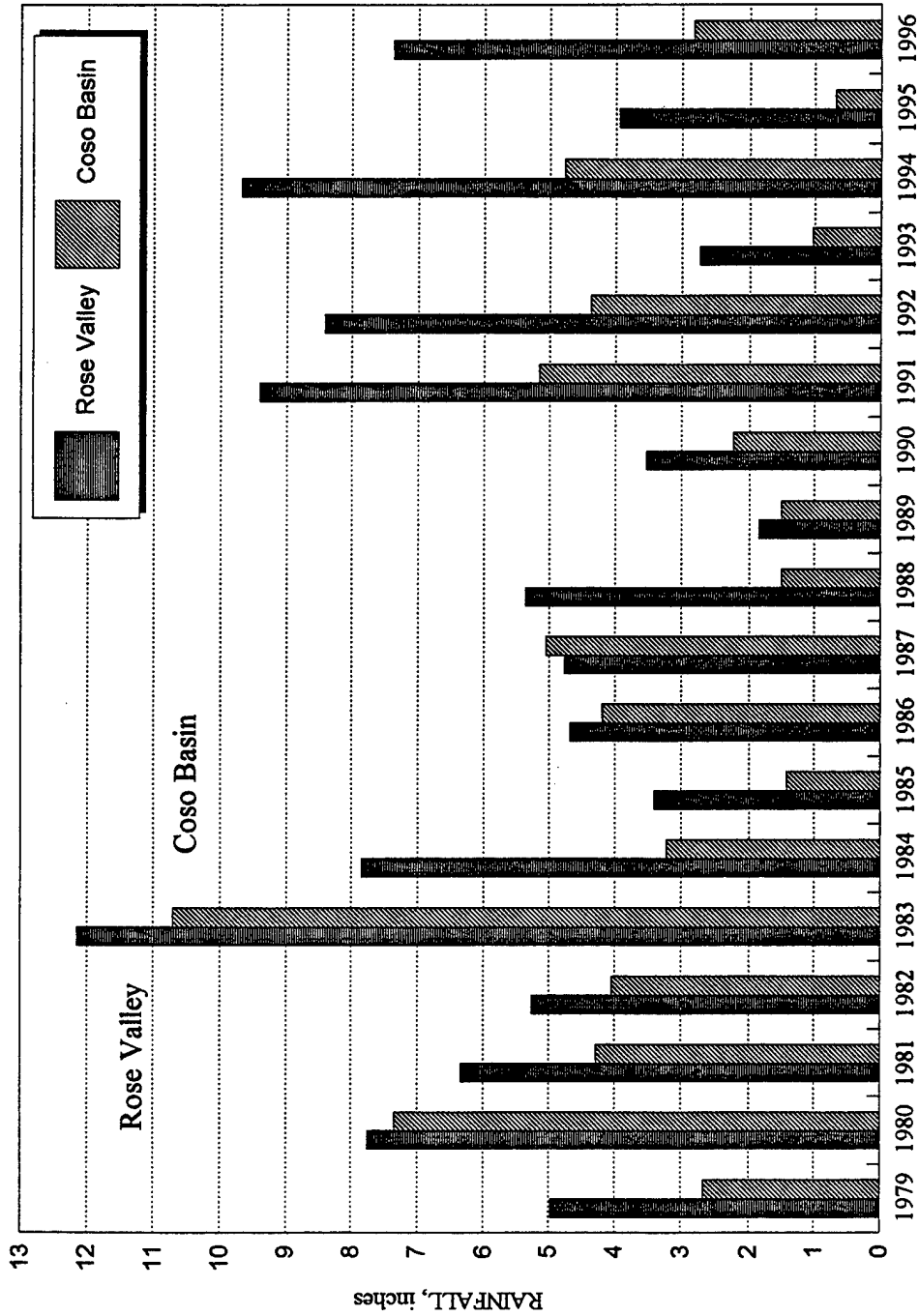


FIGURE 18. Comparison of Total Rainfall at Coso Basin and Rose Valley, 1986 Through 1996.

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TABLE 6. IWV, Rose Valley, and Coso Basin Rainfall.

Year	IWV	Rose Valley	Coso Basin
1967	4.28	4.32	
1968	3.16	3.26	
1969	5.55	8.80	
1970	3.74	6.45	
1971	1.47	2.87	
1972	1.24	1.90	
1973	2.58	4.56	
1974	7.46	9.19	
1975	1.64	2.79	
1976	3.74	8.50	
1977	4.67	8.34	
1978	10.68	12.61	
1979	5.56	4.97	2.67
1980	6.31	7.75	7.34
1981	4.49	6.34	4.28
1982	4.73	5.26	4.05
1983	10.56	12.14	10.70
1984	5.95	7.84	3.23
1985	1.29	3.42	1.42
1986	3.68	4.68	4.19
1987	4.43	4.77	5.04
1988	3.76	5.36	1.51
1989	0.94	1.85	1.51
1990	1.78	3.53	2.24
1991	7.83	9.41	5.15
1992	8.10	8.4	4.38
1993	0.94	2.74	1.04
1994	6.76	9.69	4.78
1995	7.88	3.94	0.69
1996	2.82	7.37	2.83

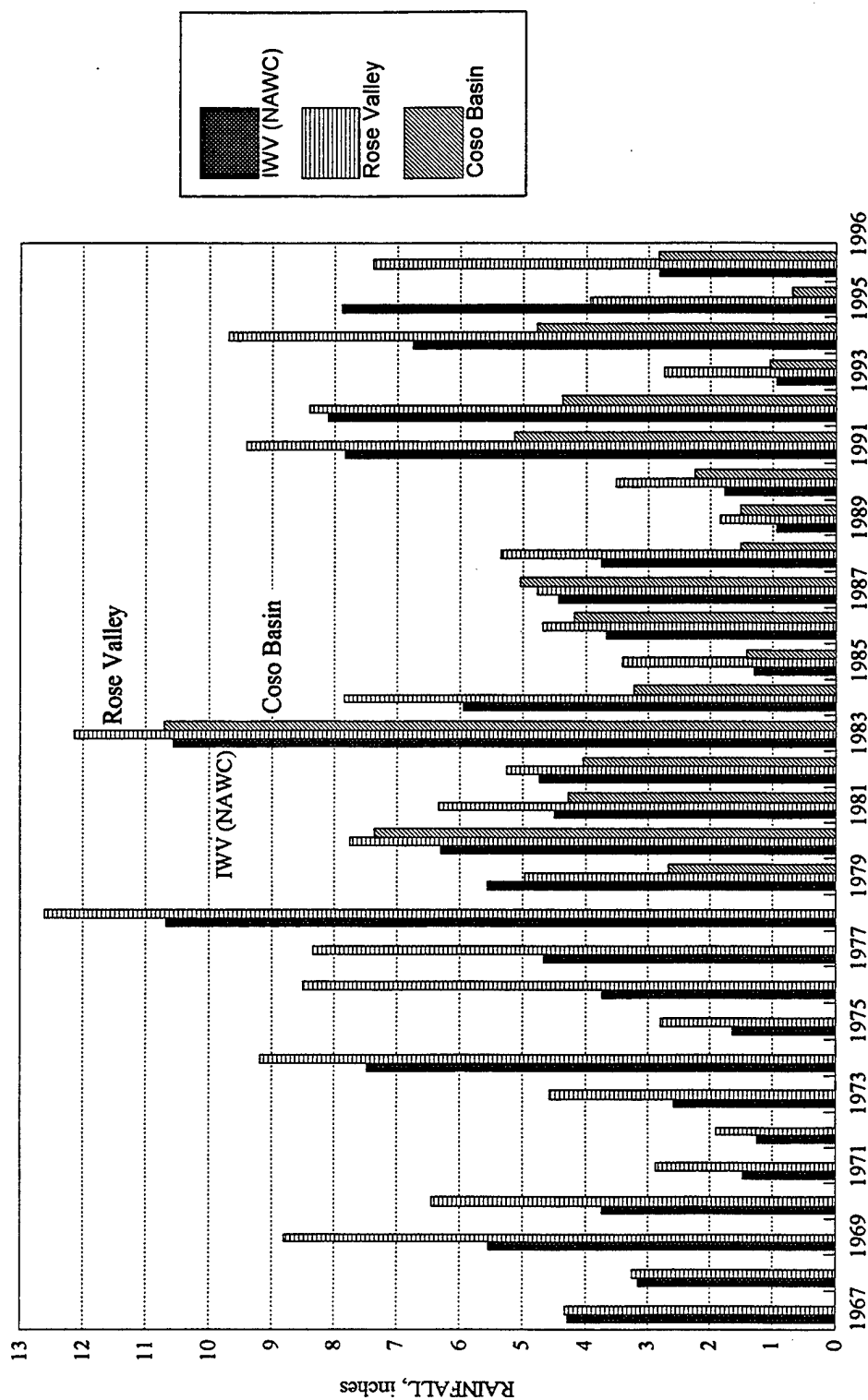


FIGURE 19. Comparison of Total Rainfall at Coso Basin, Rose Valley, and NAWC Sites, 1966 Through 1996.

**COSO HOT SPRINGS MINI-WEATHER
RECORDING STATION**

Barometric pressure, ambient temperature, relative humidity, and wind speed and wind direction are recorded at Weather Station 1, located adjacent to observation well OB-1. In March 1996 this station was integrated into the base wide weather monitoring network. This site is now maintained by NAWCWPNS Geophysics Operation personnel (Code 521410D).

Barometric pressure, ambient temperature, and relative humidity data are presented in Figure 20. Actual hourly data are expansive and will not be published. It is available from the Geothermal Program Office upon request.

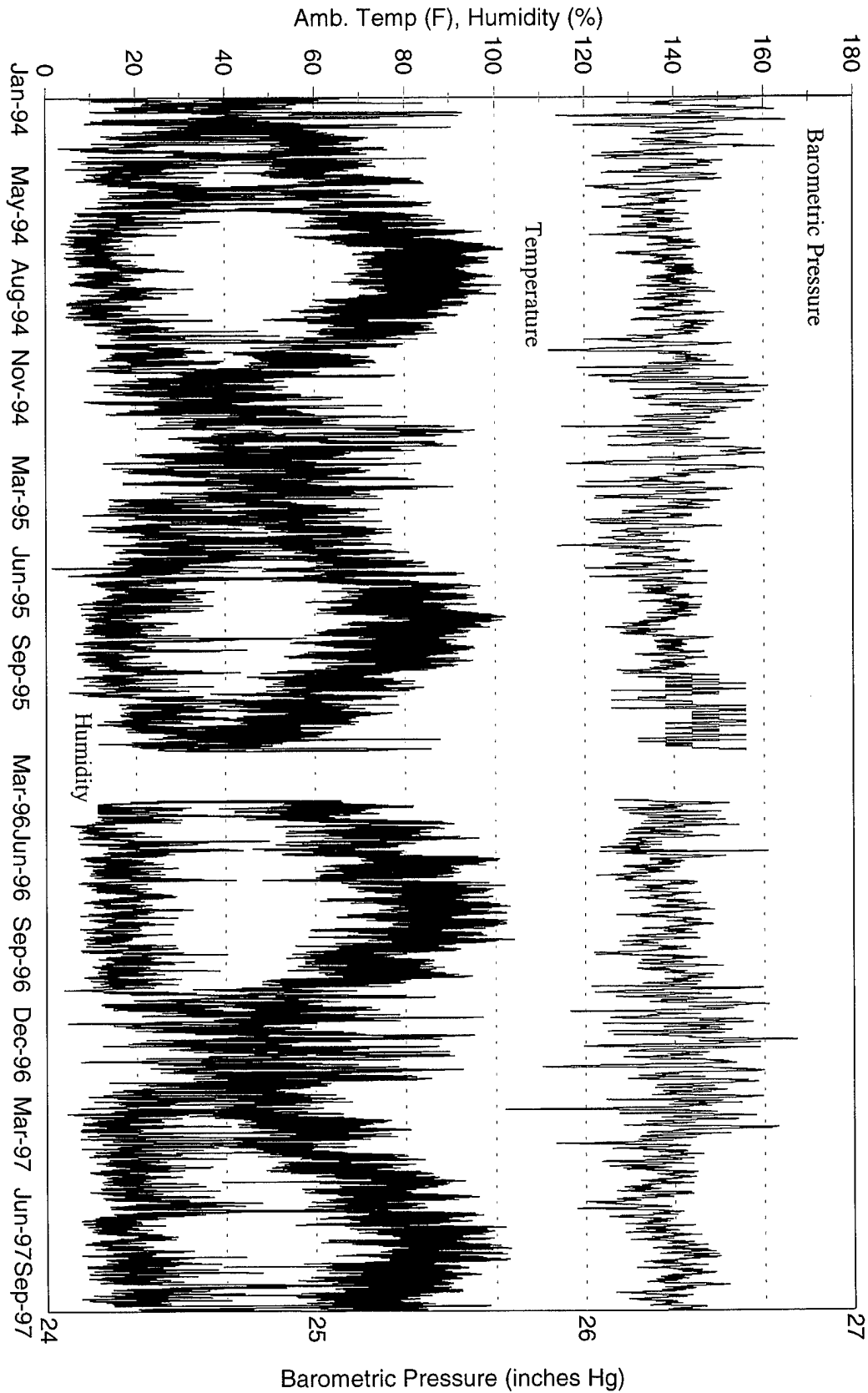


FIGURE 20. Weather Station One, Hourly Data, 19 January 1994 Through 30 September 1997.

WATER ANALYSIS OF COSO HOT SPRINGS AREA

Water samples were collected from several sites in the Coso Hot Springs area. These samples were analyzed for a suite of geothermal constituents by NAWCWPNS' Environmental Analysis Facility (Codes 4B2300D/474230D). The results are provided in Table 7. Wells 4K-1, 4P-1, and OB-1, as well as sites at Devils Kitchen, South Pool, West Canyon, and the Nichol Pool, were analyzed.

Constituents	Units	OB-1 8/18/97	4K-1 3/24/97	4K-1 8/15/97	4P-1 3/24/97	4P-1 8/15/97	Devils Kitchen 3/24/97	Devils Kitchen 8/15/97	Nichol Pool 3/24/97	Nichol Pool 8/15/97	South Pool 3/24/97	South Pool 8/15/97	West Canyon 3/24/97	West Canyon 8/15/97
Aluminum	mg/L	a	a	a	a	a	9.84	12.6	2.74	2.19	24.3	1.03	0.654	6.84
Antimony	mg/L	a	a	0.11	a	0.23	a	a	a	0.16	a	a	a	0.13
Arsenic	mg/L	a	a	0.29	a	0.15	a	0.36	a	0.65	a	0.19	a	0.33
Bicarbonate	mg/L	212	30	44.5	86	65.9	a	a	a	a	a	a	a	a
Boron	mg/L	23.7	1.0	0.19	0.8	0.12	5.1	7.12	30.3	27.4	33.9	0.40	0.7	0.17
Bromide	mg/L	a	a	a	a	0.306	a	a	5.21	6.21	a	a	a	a
Calcium	mg/L	66.4	8.4	9.10	185.0	191.3	85.7	123.3	50.6	93.3	159.0	39.4	17.6	87.3
Carbonate	mg/L	0.141	0.001	0.03402	0.034	0.00419	a	a	a	a	a	a	a	a
Chloride	mg/L	1968	8	4.97	29	188	2	2.80	1159	1296	4	1.66	1	2.41
Conductivity	µmhos/cm	6310	300	294	1653	1865	4620	6170	5760	6150	4820	1186	617	4280
Copper	mg/L	a	0.05	a	0.06	a	a	0.02	0.03	a	0.19	a	0.01	a
Fluoride	mg/L	3.62	4.25	1.79	0.716	0.910	0.495	0.526	a	a	0.399	a	0.368	0.479
Hydroxide	mg/L	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	mg/L	1.59	a	1.13	a	a	51.9	92.8	8.0	2.72	47.5	53.8	4.5	24.1
Lithium	mg/L	12.3	0.04	a	0.12	a	0.08	0.003	3.41	36.8	0.16	a	0.03	a
Magnesium	mg/L	6.90	0.72	0.58	0.76	1.16	29	50.2	14	19.0	81	26.8	14	22.9
Manganese	mg/L	0.35	0.09	0.03	1.03	0.43	1.90	2.40	1.20	8.50	8.22	0.62	0.85	1.97
Mercury	mg/L	a	a	a	a	a	a	a	a	a	a	a	a	a
pH	units	7.16	6.22	6.82	6.46	7.14	2.34	2.28	2.50	2.58	2.57	3.05	3.50	2.54
Potassium	mg/L	245	17.9	17.3	99.7	146	36.3	51.1	122	234	51.9	37.9	36.3	47.5
Selenium	mg/L	a	a	a	0.12	a	0.07	a	0.042	a	0.243	a	0.02	0.15
Silica	mg/L	38.8	197	208	117	106	281	234	287	342	442	281	276	284
Sodium	mg/L	2594	42	92.4	188	334	39	78.3	657	1424	61	26.7	42	149
Sroutium	mg/L	2.94	0.139	a	1.75	1.14	0.178	0.2	0.197	0.27	0.095	0.06	0.132	0.07
Sulfate	mg/L	94.1	83	82.3	705	889	1114	1754	548	710	2488	577	235	1398
TDS	mg/L	3302	436	453	1608	1641	1558	1795	2913	2892	3830	911	745	1814
Thallium	mg/L	0.06	a	a	a	a	a	a	0.013	0.10	a	0.10	a	0.08
Zinc	mg/L	0.03	0.48	a	a	0.89	0.079	a	0.05	0.19	1.18	0.05	0.054	a

Note:
a = none detected

TABLE 7. Chemical Analysis of Coso Area Surface and Near-Surface Thermal Waters.

TEMPERATURE RECORDINGS OF THE COSO RESORT AREA WELLS

The temperature logs from wells 4K-1, 4P-1, and Coso No. 1 are graphed in Figure 21, with the data listed in Tables 8 through 10. These data were recorded using the TD Probe System, manufactured by Natural Progress Instruments, Dallas, Texas.

TABLE 8. Temperature Recordings at Well 4K-1.

Depth, ft	Elevation, ft AMSL	Temperature °F on 26 March 1997
0	3658	205.6
-5	3653	205.6
-10	3648	205.6
-15	3643	205.6
-20	3638	205.6
-25	3633	205.6
-30	3628	205.6
-35	3623	205.6
-40	3618	205.6
-45	3613	205.6
-50	3608	205.6
-51	3607	205.7
-52	3606	205.6
-53	3605	205.6
-54	3604	206.8
-55	3603	206.6
-56	3602	208.0
-57	3601	209.3
-58	3600	209.5
-59	3599	209.9
-60	3598	210.1
-65	3593	212.7
-70	3588	212.9
-75	3583	214.1
-80	3578	214.9

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TABLE 9. Temperature Recordings at Well 4P-1.

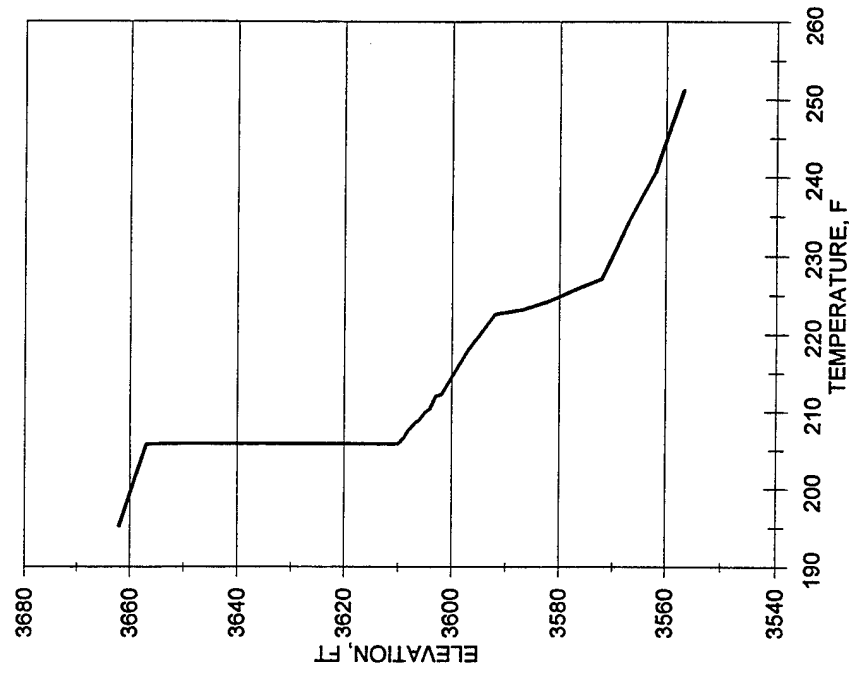
Depth, ft	Elevation, ft AMSL	Temperature °F on 26 March 1997
0	3662	195.3
-5	3657	205.8
-10	3652	205.9
-15	3647	205.9
-20	3642	205.9
-25	3637	205.9
-30	3632	205.9
-35	3627	205.9
-40	3622	205.9
-45	3617	205.9
-50	3612	205.9
-51	3611	205.9
-52	3610	205.9
-53	3609	206.7
-54	3608	207.7
-55	3607	208.5
-56	3606	209.0
-57	3605	209.9
-58	3604	210.4
-59	3603	212.0
-60	3602	212.3
-65	3597	218.1
-70	3592	222.6
-75	3587	223.2
-80	3582	224.3
-85	3577	225.8
-90	3572	227.2
-95	3567	234.5
-100	3562	240.8
-105	3557	251.3

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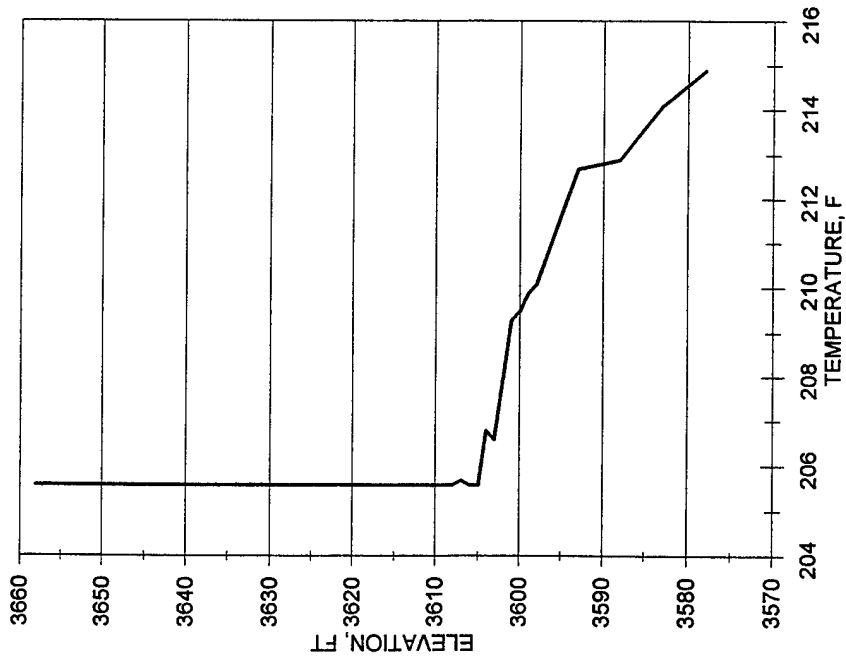
TABLE 10. Temperature Recordings at Coso No. 1.

Depth, ft	Elevation, ft AMSL	Temperature °F on 26 March 1997
0	3615	253.6
-10	3605	253.8
-20	3595	256.0
-30	3585	256.0
-40	3575	256.0
-50	3565	256.0
-60	3555	256.0
-70	3545	256.0
-80	3535	256.0
-90	3525	256.0
-100	3515	256.0
-110	3505	256.0
-120	3495	256.0
-130	3485	256.0
-140	3475	256.2
-150	3465	256.2
-160	3455	256.2
-170	3445	256.2
-180	3435	256.2
-190	3425	256.2
-200	3415	256.2
-210	3405	256.2
-220	3395	256.2
-230	3385	256.2
-240	3375	256.2
-250	3365	256.2
-260	3355	256.2
-270	3345	256.2
-280	3335	256.2
-290	3325	256.2
-300	3315	256.2
-305	3310	257.2
-310	3305	257.2
-315	3300	257.2
-320	3295	257.2
-321	3294	258.0
-322	3293	258.8
-323	3292	259.5
-324	3291	260.0
-325	3290	261.1
-326	3289	261.6
-327	3288	262.2
-328	3287	262.5
-329	3286	262.7
-330	3285	262.7
-331	3284	262.7
-332	3283	262.7
-335	3282	263.3
-340	3281	264.1
-345	3276	266.2
-350	3271	267.1
-355	3266	267.6
-360	3261	268.0

FIGURE 21. Temperature Profiles

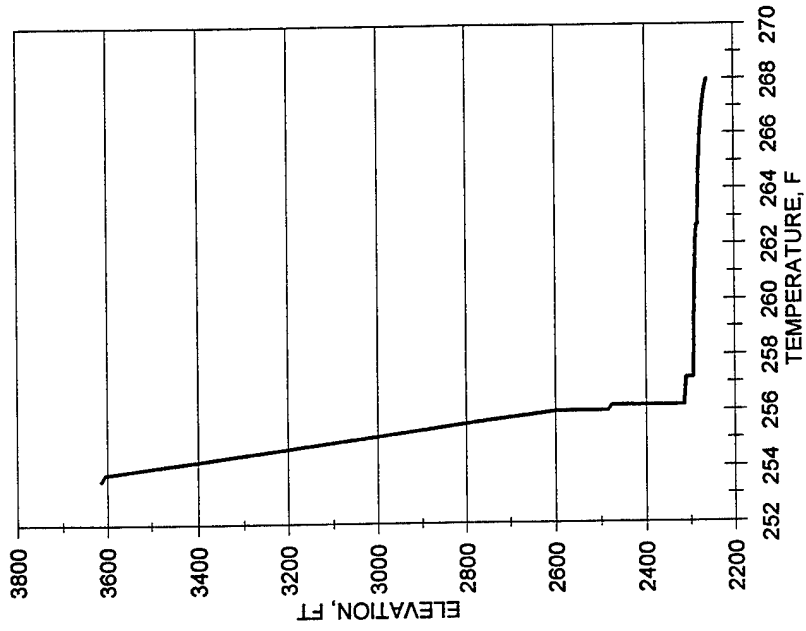


b. Well 4P-1 Temperature Gradient Log.



a. Well 4K-1 Temperature Gradient Log.

FIGURE 21. Temperature Profiles.



c. Coso No. 1 Temperature Gradient Log.

FIGURE 21. (Contd.)

OTHER GEOTHERMAL ACTIVITY AT COSO HOT SPRINGS

WEST CANYONS

The two west canyons are located approximately 0.7 km west of the Coso Resort area and on a course perpendicular to the strike-slip fault that runs north and south through the Coso Hot Springs area.

The southerly canyon, which has rain station No. 2 located at the west end, consists of hydrothermal alteration and scattered thermal activity both in the canyon and a wide area at the mouth of the canyon. The geology of this canyon indicates an extensive history of fluctuating thermal activities and features. The prominent area of present activity in the canyon includes an active steam vent bordering a vigorously boiling pool. At a greater distance up the canyon are two diminutive steam vents, small springs and fossil hot spring terrace deposits. Thermal activity in these areas is sporadic, depending upon climatic conditions. Some notable changes in the level of thermal activity have occurred here during this reporting period. An increase in the fluid discharge from the west canyon area has been noted. At first blush it would appear that this is most likely a run-off contribution from the increase in rainfall in the area during the reporting period. However, it has been demonstrated using geochemistry (both elemental and stable isotope) that the water levels in the shallow pools of the Coso Hot Springs area are not significantly affected by local rainfall.

We have no isotope data from these waters for this reporting period, but we do have two chemical analyses from March and August 1997 (Table 7). Comparing the August sample with analyses from both the March sample and samples from the past two years (NAWS-CL TP 007 and NAWS-CL TP 008) indicates a drop in the pH of the fluid (increasing acidity) coupled with a marked rise in sulfate, conductivity, TDS, and iron. Throughout this three-year period the amount of silica dissolved in the fluid has remained essentially constant. There also appears to be a small to moderate increase in the concentration of several anions and cations in the August 1997 sample.

These data imply a couple of different activities. The drop in pH coupled with the increase in sulfate can be caused by an increase of steam/non-condensable gas (H_2S and CO_2) flow into this thermal area. The increase in gas activity (bubbling in the mud/water mixture in the pool) would promote an increase in the anion/cation content of the water. Silica concentrations stay about the same because the temperature of the water doesn't vary significantly.

It is equally likely, however, that these same changes in the chemistry could be caused by rainwater collecting in the canyon, running over and percolating through the old, but hot, thermal mineral deposits, and dissolving some of the minerals. Next year's water analysis, which we will take in the spring and fall and which will include stable isotope analyses, may help to clarify the source or sources of this increased discharge.

The northerly west canyon holds an extensive area of hydrothermal alteration and fossil hot spring deposits. Present thermal activity is limited to warm-to-hot ground with a small number of steam vents. The earth slump, first noted in NAWS-CL TP 001, has continued to stabilize during the past year. Much of the slump area is warm-to-hot, with steam emanating from multiple vents, specifically along the face of the slump. The small pools of mud and steam condensate, noted in last year's summary are still present to the west of the slump.

As a whole, these sites appear to be largely unchanged from last year. One of the indicators of newly heated ground is the die-off of vegetation. The distribution of plant life in these canyons has stayed essentially unchanged.

DISCUSSION AND SUMMARY

The data recovered from each of the steam flow monitoring sites: Devils Kitchen, well 4H-4, and Schober's Resort have been considerably less erratic during the past three years than the data recovered prior to 1994. This is primarily due to the new recording equipment and a formal periodic maintenance and calibration schedule.

The water level in well 4P-1 has risen 21 feet since the beginning of the monitoring program in 1978. Most of this water level rise occurred since 1989 and seems to have stabilized at 3613.3 feet ASL. The water in this well is predominately a steam condensate and probably represents a small perched water table.

In contrast to well 4P-1 and OB-2, the water level in well OB-1 continues to drop slightly. Well OB-1 is located adjacent to the south side of Coso Wash and is clearly set in valley fill sediments, so it is unclear why the level has dropped some 40 feet since 1988. While water analyses indicate a partial geothermal fluid component, the predominant water source is clearly inflow of meteoric water from the mountains to the north and east. The groundwater around well OB-1 may still be responding to relatively low rainfall conditions in the region from 1985 through 1990, or the groundwater may just be seeking equilibrium with groundwater on the north side of the wash (represented by well OB-2).

As discussed in previous monitoring reports, the water level in Coso No. 1 is clearly influenced by the thermal activity along the hot springs fault. The level has dropped about 175 feet since 1984 due to a significant influx of heat and boiling-off of water. Since the wellhead was repaired and the well shut in, the water level appears to have stabilized.

There has been no significant change in thermal activity at the South Pool this past year. The water level continues to fluctuate seasonally, as does the water temperature, which exhibits about a ten degree (F) seasonal variation.

Additional observations:

During this reporting period, the central Coso Fault thermal area has changed moderately. The thermal area includes the old corrosion array, the Coso Resort mudfield, the South Pool, and the smaller pool and pots in between. While no new manifestation such as mud pots have formed here, the existing mud pots, craters, and fumaroles have enlarged somewhat in size. This seems to especially true just south of the South Pool where the existing mud pots not only have increased in size, the amount of fluid in the pots appears to have increased also. The Geothermal Program Office is continuing to closely monitor these changes.

The surface ground temperatures at hot spots both around the Upper Coso Wash Valley and along the periphery of the Coso Fault system have remained stable during the monitoring period. A hot spot is identified by warm-to-hot near-surface temperatures, discolored (cooked) soil, and/or die-off of vegetation. The shallow-rooted grasses, scrubs, and deep-rooted creosote bushes that have grown in these hot spots have remained the same since the last monitoring period.

This year's data, particularly that from the surface pools, pots, fumaroles, and hot spots, indicate seasonal fluctuation in temperatures and water levels; no significant increase or decrease of activity is occurring or has occurred during this monitoring period. Continuance of this monitoring program will enable us to determine if this stable trend continues.

NEW WORK

For the reporting period of 1997/98 there will be new data loggers for the tipping bucket rain gauges. The previous data loggers were out-dated and becoming unreliable. The new data loggers are all electronic and the data can be read directly into the office PC and sent to a spreadsheet where graphs can be made.

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Appendix
DAILY STEAM FLOW

NAWS-CL TP 010

4H4 Steam Flow 10/96 through 9/97					Schobers Steam Flow 10/96 through 9/97					Devils Kitchen Steam Flow 10/96 through 9/97				
DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h	DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h	DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h
10/01/96	298	290	293	293	10/01/96	926	912	915	915	10/01/96	509	495	502	502
10/02/96	292	285	288	288	10/02/96	926	912	915	915	10/02/96	506	491	498	498
10/03/96	287	285	285	285	10/03/96	926	905	912	912	10/03/96	503	489	496	496
10/04/96	290	281	284	284	10/04/96	926	905	912	912	10/04/96	508	489	499	499
10/05/96	291	281	285	285	10/05/96	926	905	912	912	10/05/96	508	489	499	499
10/06/96	287	280	283	283	10/06/96	923	905	911	911	10/06/96	504	489	497	497
10/07/96	287	280	283	283	10/07/96	926	905	912	912	10/07/96	508	485	498	498
10/08/96	291	281	284	284	10/08/96	926	905	912	912	10/08/96	510	489	499	499
10/09/96	297	290	293	293	10/09/96	926	905	912	912	10/09/96	511	489	501	501
10/10/96	292	285	288	288	10/10/96	926	908	914	914	10/10/96	508	489	499	499
10/11/96	297	290	293	293	10/11/96	926	905	912	912	10/11/96	508	488	498	498
10/12/96	292	286	288	288	10/12/96	923	908	912	912	10/12/96	510	492	499	499
10/13/96	295	285	289	289	10/13/96	919	905	909	909	10/13/96	508	489	499	499
10/14/96	287	282	284	284	10/14/96	923	905	911	911	10/14/96	506	491	498	498
10/15/96	300	285	292	292	10/15/96	923	905	909	909	10/15/96	503	489	496	496
10/16/96	298	290	293	293	10/16/96	926	905	912	912	10/16/96	508	492	501	501
10/17/96	282	280	280	280	10/17/96	923	906	912	912	10/17/96	510	494	502	502
10/18/96	306	280	287	287	10/18/96	926	905	912	912	10/18/96	511	484	498	498
10/19/96	307	280	291	291	10/19/96	926	908	915	915	10/19/96	514	491	502	502
10/20/96	282	275	278	278	10/20/96	923	905	914	914	10/20/96	512	496	505	505
10/21/96	282	256	271	271	10/21/96	910	901	903	903	10/21/96	497	483	487	487
10/22/96	295	266	277	277	10/22/96	910	881	894	894	10/22/96	488	471	479	479
10/23/96	303	300	301	301	10/23/96	910	889	897	897	10/23/96	508	484	498	498
10/24/96	307	290	298	298	10/24/96	926	912	915	915	10/24/96	514	495	505	505
10/25/96	310	300	304	304	10/25/96	934	920	925	925	10/25/96	519	496	507	507
10/26/96	297	275	285	285	10/26/96	938	920	926	926	10/26/96	519	492	506	506
10/27/96	287	275	280	280	10/27/96	910	897	901	901	10/27/96	503	477	488	488
10/28/96	297	285	288	288	10/28/96	926	889	905	905	10/28/96	500	472	490	490
10/29/96	297	287	287	287	10/29/96	923	905	909	909	10/29/96	504	484	495	495
10/30/96	297	295	295	295	10/30/96	929	905	914	914	10/30/96	503	492	497	497
10/31/96	302	270	283	283	10/31/96	934	905	915	915	10/31/96	508	484	497	497
11/01/96	300	280	287	287	11/01/96	929	920	922	922	11/01/96	503	478	490	490
11/02/96	287	280	283	283	11/02/96	926	905	912	912	11/02/96	501	478	489	489
11/03/96	305	285	294	294	11/03/96	938	920	926	926	11/03/96	514	489	502	502
11/04/96	302	290	295	295	11/04/96	935	920	925	925	11/04/96	513	491	501	501
11/05/96	302	285	290	290	11/05/96	938	920	926	926	11/05/96	507	491	499	499
11/06/96	287	277	282	282	11/06/96	926	905	912	912	11/06/96	503	489	496	496
11/07/96	282	275	278	278	11/07/96	923	912	914	914	11/07/96	503	452	483	483
11/08/96	292	280	285	285	11/08/96	926	905	912	912	11/08/96	508	484	496	496
11/09/96	302	290	295	295	11/09/96	930	919	922	922	11/09/96	514	495	502	502
11/10/96	302	300	300	300	11/10/96	938	922	928	928	11/10/96	514	495	505	505
11/11/96	297	295	295	295	11/11/96	943	922	929	929	11/11/96	508	492	502	502
11/12/96	285	287	290	290	11/12/96	941	933	934	934	11/12/96	507	489	498	498
11/13/96	297	292	294	294	11/13/96	957	920	936	936	11/13/96	513	495	504	504
11/14/96	313	300	308	308	11/14/96	957	936	944	944	11/14/96	515	506	510	510
11/15/96	317	290	303	303	11/15/96	945	936	937	937	11/15/96	520	489	507	507
11/16/96	287	285	288	288	11/16/96	941	933	934	934	11/16/96	503	488	496	496
11/17/96	292	285	288	288	11/17/96	941	933	934	934	11/17/96	504	489	497	497
11/18/96	292	280	285	285	11/18/96	941	928	931	931	11/18/96	507	485	497	497
11/19/96	298	287	294	294	11/19/96	941	928	931	931	11/19/96	514	492	502	502
11/20/96	297	280	288	288	11/20/96	941	920	928	928	11/20/96	508	484	498	498
11/21/96	296	289	292	292	11/21/96	941	920	928	928	11/21/96	507	491	499	499
11/22/96	298	287	293	293	11/22/96	941	920	928	928	11/22/96	510	490	500	500

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4H4 Steam Flow 10/96 through 9/97					Schobers Steam Flow 10/96 through 9/97					Devils Kitchen Steam Flow 10/96 through 9/97				
DATE	High, lb/h	Low, lb/h	Avg, lb/h		DATE	High, lb/h	Low, lb/h	Avg, lb/h		DATE	High, lb/h	Low, lb/h	Avg, lb/h	
11/23/96	282	270	275		11/23/96					11/23/96	497	487	487	
11/24/96	282	270	275		11/24/96					11/24/96	500	478	489	
11/25/96	292	280	285		11/25/96					11/25/96	503	489	496	
11/26/96	290	276	285		11/26/96					11/26/96	501	487	493	
11/27/96	287	280	283		11/27/96	926	905	912		11/27/96	500	484	491	
11/28/96	324	285	303		11/28/96	957	920	936		11/28/96	527	495	510	
11/29/96	302	282	292		11/29/96	934	920	925		11/29/96	498	484	491	
11/30/96	277	275	275		11/30/96	924	912	915		11/30/96	490	478	485	
12/01/96	302	280	290		12/01/96	934	917	925		12/01/96	507	484	493	
12/02/96	287	280	283		12/02/96	926	905	912		12/02/96	497	455	476	
12/03/96	292	270	280		12/03/96	926	912	915		12/03/96	503	489	496	
12/04/96	287	280	283		12/04/96	926	917	919		12/04/96	503	484	493	
12/05/96	317	285	300		12/05/96	949	920	931		12/05/96	516	495	505	
12/06/96	317	282	298		12/06/96	941	925	931		12/06/96	507	484	495	
12/07/96	277	274	275		12/07/96	935	926	928		12/07/96	491	478	485	
12/08/96	295	276	290		12/08/96	927	920	920		12/08/96	503	484	493	
12/09/96	302	295	298		12/09/96	927	920	920		12/09/96	507	483	495	
12/10/96	297	290	293		12/10/96	927	920	920		12/10/96	504	488	495	
12/11/96	291	280	285		12/11/96	926	905	912		12/11/96	496	483	487	
12/12/96	288	282	284		12/12/96	934	912	920		12/12/96	497	483	491	
12/13/96	287	280	283		12/13/96	930	912	920		12/13/96	497	484	490	
12/14/96	277	275	275		12/14/96	930	920	922		12/14/96	492	480	486	
12/15/96	277	272	274		12/15/96	926	917	917		12/15/96	497	478	489	
12/16/96	301	286	292		12/16/96	937	915	925		12/16/96	510	489	499	
12/17/96	297	280	288		12/17/96	935	912	920		12/17/96	501	488	495	
12/18/96	287	280	283		12/18/96	926	917	919		12/18/96	508	484	496	
12/19/96	297	290	292		12/19/96	930	920	922		12/19/96	508	487	499	
12/20/96	309	292	300		12/20/96	941	920	928		12/20/96	513	491	501	
12/21/96	317	306	311		12/21/96	941	920	928		12/21/96	514	501	509	
12/22/96	305	282	288		12/22/96	957	936	944		12/22/96	508	486	498	
12/23/96	280	260	267		12/23/96	949	936	940		12/23/96	482	467	474	
12/24/96	283	265	274		12/24/96	945	933	936		12/24/96	497	478	487	
12/25/96	302	287	293		12/25/96	957	936	944		12/25/96	508	484	496	
12/26/96	295	280	290		12/26/96	970	951	958		12/26/96	508	489	499	
12/27/96	305	295	300		12/27/96	973	954	961		12/27/96	507	495	501	
12/28/96	299	291	294		12/28/96	970	951	958		12/28/96	505	489	497	
12/29/96	285	281	282		12/29/96	957	948	950		12/29/96	497	484	490	
12/30/96	287	279	283		12/30/96	963	948	953		12/30/96	499	484	491	
12/31/96	288	285	287		12/31/96	957	948	950		12/31/96	501	489	495	
01/01/97	288	280	283		01/01/97	957	948	950		01/01/97	500	488	495	
01/02/97	284	284	283		01/02/97	957	948	950		01/02/97	494	484	489	
01/03/97	306	300	302		01/03/97	989	967	975		01/03/97	514	495	505	
01/04/97	297	277	288		01/04/97	976	967	968		01/04/97	511	491	502	
01/05/97	287	280	283		01/05/97	976	964	967		01/05/97	503	487	495	
01/06/97	295	290	291		01/06/97	976	951	961		01/06/97	503	483	491	
01/07/97	282	251	270		01/07/97	957	944	944		01/07/97	491	467	479	
01/08/97	287	252	272		01/08/97	967	948	958		01/08/97	497	481	490	
01/09/97	287	281	285		01/09/97	973	964	965		01/09/97	498	489	494	
01/10/97	292	290	290		01/10/97	974	964	967		01/10/97	501	487	494	
01/11/97	312	304	308		01/11/97	985	967	973		01/11/97	519	489	506	
01/12/97	312	311	311		01/12/97	989	970	976		01/12/97	519	495	505	
01/13/97	307	282	291		01/13/97	989	979	981		01/13/97	513	501	507	
01/14/97	280	269	272		01/14/97	981	967	972		01/14/97	511	484	500	

4H4 Steam Flow 10/96 through 9/97					Schobers Steam Flow 10/96 through 9/97					Devils Kitchen Steam Flow 10/96 through 9/97				
DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h	DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h	DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h
01/15/97	276	265	269	268	01/15/97	973	951	959	959	01/15/97	519	497	508	508
01/16/97	272	265	268	268	01/16/97	960	951	953	953	01/16/97	491	477	485	485
01/17/97	278	275	276	276	01/17/97	960	951	953	953	01/17/97	494	481	487	487
01/18/97	278	275	276	276	01/18/97	957	944	948	948	01/18/97	494	478	486	486
01/19/97	282	280	285	285	01/19/97	957	944	948	948	01/19/97	506	484	497	497
01/20/97	302	292	296	295	01/20/97	957	940	947	947	01/20/97	500	481	490	490
01/21/97	302	293	296	296	01/21/97	954	940	944	944	01/21/97	487	475	481	481
01/22/97	296	291	293	293	01/22/97	957	939	945	945	01/22/97	503	479	488	488
01/23/97	300	292	296	296	01/23/97	959	951	951	951	01/23/97	491	479	486	486
01/24/97	292	290	290	290	01/24/97	960	951	953	953	01/24/97	498	484	491	491
01/25/97	287	280	283	283	01/25/97	957	950	951	951	01/25/97	498	484	490	490
01/26/97	293	291	291	291	01/26/97	960	950	951	951	01/26/97	501	490	496	496
01/27/97	297	276	287	287	01/27/97	957	948	950	950	01/27/97	508	489	499	499
01/28/97	272	270	270	270	01/28/97	960	951	953	953	01/28/97	507	489	498	498
01/29/97	286	271	279	279	01/29/97	957	948	950	950	01/29/97	503	489	496	496
01/30/97	288	280	285	285	01/30/97	957	936	944	944	01/30/97	503	484	490	490
01/31/97	290	281	285	285	01/31/97	957	936	944	944	01/31/97	504	484	494	494
02/01/97	298	285	292	292	02/01/97	957	945	948	948	02/01/97	508	491	501	501
02/02/97	297	290	293	293	02/02/97	957	948	950	950	02/02/97	508	492	501	501
02/03/97	297	280	288	288	02/03/97	957	948	950	950	02/03/97	503	488	495	495
02/04/97	287	280	280	283	02/04/97	960	951	953	953	02/04/97	503	484	493	493
02/05/97	296	290	292	292	02/05/97	962	950	953	953	02/05/97	503	491	497	497
02/06/97	280	276	277	277	02/06/97	973	951	959	959	02/06/97	500	489	495	495
02/07/97	286	277	280	280	02/07/97	957	948	950	950	02/07/97	492	479	486	486
02/08/97	295	285	288	288	02/08/97	957	948	950	950	02/08/97	497	484	490	490
02/09/97	294	285	288	288	02/09/97	960	951	953	953	02/09/97	501	489	495	495
02/10/97	312	295	300	300	02/10/97	960	951	953	953	02/10/97	493	483	487	487
02/11/97	290	282	283	283	02/11/97	970	951	958	958	02/11/97	500	485	493	493
02/12/97	288	257	263	263	02/12/97	973	953	959	959	02/12/97	500	489	495	495
02/13/97	280	276	275	275	02/13/97	960	947	951	951	02/13/97	494	475	485	485
02/14/97	286	277	278	278	02/14/97	960	948	951	951	02/14/97	496	481	489	489
02/15/97	295	282	285	285	02/15/97	957	948	950	950	02/15/97	495	485	490	490
02/16/97	282	280	285	285	02/16/97	971	951	958	958	02/16/97	501	488	495	495
02/17/97	292	285	288	288	02/17/97	981	954	965	965	02/17/97	514	483	499	499
02/18/97	290	285	286	286	02/18/97	956	936	942	942	02/18/97	492	471	481	481
02/19/97	295	275	284	284	02/19/97	954	944	947	947	02/19/97	491	477	483	483
02/20/97	322	309	315	315	02/20/97	992	967	975	975	02/20/97	498	479	489	489
02/21/97	290	262	274	274	02/21/97	973	951	958	958	02/21/97	503	489	497	497
02/22/97	267	257	261	261	02/22/97	960	947	950	950	02/22/97	497	480	489	489
02/23/97	295	274	285	285	02/23/97	959	950	951	951	02/23/97	498	479	490	490
02/24/97	301	275	286	286	02/24/97	959	944	947	947	02/24/97	504	474	488	488
02/25/97	272	265	268	268	02/25/97	963	951	954	954	02/25/97	495	476	483	483
02/26/97	264	264	263	263	02/26/97	960	951	953	953	02/26/97	511	485	490	490
02/27/97	278	270	274	274	02/27/97	957	942	945	945	02/27/97	517	489	502	502
02/28/97	274	265	271	271	02/28/97	962	939	944	944	02/28/97	497	475	485	485
03/01/97	296	285	290	290	03/01/97	952	939	942	942	03/01/97	488	470	479	479
03/02/97	287	280	284	284	03/02/97	954	942	945	945	03/02/97	497	480	489	489
03/03/97	287	280	284	284	03/03/97	949	936	939	939	03/03/97	499	484	492	492
03/04/97	297	285	290	290	03/04/97	956	939	944	944	03/04/97	490	472	482	482
03/05/97	305	300	302	302	03/05/97	965	947	953	953	03/05/97	486	477	482	482
03/06/97	298	285	289	289	03/06/97	963	951	954	954	03/06/97	506	485	494	494
03/07/97	295	290	291	291	03/07/97	976	958	962	962	03/07/97	499	489	495	495
03/08/97	286	276	283	283	03/08/97	976	964	964	964	03/08/97	498	484	491	491

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4H4 Steam Flow 10/96 through 9/97					Schobers Steam Flow 10/96 through 9/97					Devils Kitchen Steam Flow 10/96 through 9/97				
DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h	DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h	DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h
03/09/97	280	271	274	274	03/09/97	973	959	962	962	03/09/97	492	478	487	487
03/10/97	297	277	287	287	03/10/97	967	954	958	958	03/10/97	503	484	493	493
03/11/97	302	295	297	297	03/11/97	974	958	962	962	03/11/97	508	494	501	501
03/12/97	289	290	289	289	03/12/97	973	964	965	965	03/12/97	503	489	496	496
03/13/97	286	280	283	283	03/13/97	985	968	975	975	03/13/97	498	484	491	491
03/14/97	297	285	288	288	03/14/97	989	975	978	978	03/14/97	504	487	495	495
03/15/97	297	292	295	295	03/15/97	989	976	979	979	03/15/97	504	493	498	498
03/16/97	291	282	284	284	03/16/97	985	978	979	979	03/16/97	503	484	494	494
03/17/97	275	265	269	269	03/17/97	973	964	965	965	03/17/97	491	478	485	485
03/18/97	272	260	265	265	03/18/97	970	959	962	962	03/18/97	491	475	483	483
03/19/97	273	267	269	269	03/19/97	970	961	962	962	03/19/97	490	480	485	485
03/20/97	302	289	293	293	03/20/97	989	968	975	975	03/20/97	508	491	500	500
03/21/97	295	293	293	293	03/21/97	985	975	976	976	03/21/97	503	492	497	497
03/22/97	297	287	289	289	03/22/97	984	970	973	973	03/22/97	503	489	496	496
03/23/97	294	289	289	289	03/23/97	984	967	972	972	03/23/97	500	487	493	493
03/24/97	284	275	277	277	03/24/97	978	965	968	968	03/24/97	496	483	489	489
03/25/97	282	272	275	275	03/25/97	973	962	965	965	03/25/97	493	478	485	485
03/26/97	282	280	280	280	03/26/97	985	967	973	973	03/26/97	492	484	488	488
03/27/97	298	290	293	293	03/27/97	985	972	975	975	03/27/97	503	491	496	496
03/28/97	292	280	287	287	03/28/97	981	967	970	970	03/28/97	499	478	490	490
03/29/97	282	270	275	275	03/29/97	971	954	959	959	03/29/97	490	477	483	483
03/30/97	293	277	285	285	03/30/97	973	959	962	962	03/30/97	501	483	491	491
03/31/97	292	282	284	284	03/31/97	971	951	959	959	03/31/97	497	485	491	491
04/01/97	284	275	280	280	04/01/97	957	944	947	947	04/01/97	493	478	486	486
04/02/97	287	282	284	284	04/02/97	957	944	945	945	04/02/97	491	479	485	485
04/03/97	288	282	284	284	04/03/97	973	951	959	959	04/03/97	503	484	494	494
04/04/97	301	285	288	288	04/04/97	985	959	968	968	04/04/97	507	485	495	495
04/05/97	308	290	298	298	04/05/97	970	954	959	959	04/05/97	492	478	484	484
04/06/97	281	274	276	276	04/06/97	967	951	954	954	04/06/97	485	475	479	479
04/07/97	283	274	278	278	04/07/97	973	954	959	959	04/07/97	489	478	484	484
04/08/97	296	280	287	287	04/08/97	974	959	964	964	04/08/97	497	484	491	491
04/09/97	287	276	283	283	04/09/97	973	959	962	962	04/09/97	498	489	494	494
04/10/97	285	280	281	281	04/10/97	970	958	961	961	04/10/97	497	478	489	489
04/11/97	287	275	279	279	04/11/97	968	951	958	958	04/11/97	498	477	488	488
04/12/97	282	275	276	276	04/12/97	951	942	944	944	04/12/97	492	478	485	485
04/13/97	287	276	282	282	04/13/97	965	951	954	954	04/13/97	493	482	487	487
04/14/97	286	280	281	281	04/14/97	970	954	959	959	04/14/97	493	483	487	487
04/15/97	282	275	277	277	04/15/97	967	948	954	954	04/15/97	491	481	486	486
04/16/97	287	276	284	284	04/16/97	973	961	962	962	04/16/97	492	482	487	487
04/17/97	282	275	279	279	04/17/97	970	951	961	961	04/17/97	491	484	487	487
04/18/97	291	280	284	284	04/18/97	985	970	973	973	04/18/97	492	479	486	486
04/19/97	280	279	278	278	04/19/97	989	975	978	978	04/19/97	493	478	485	485
04/20/97	281	267	273	273	04/20/97	978	968	970	970	04/20/97	489	477	483	483
04/21/97	288	275	283	283	04/21/97	979	967	970	970	04/21/97	492	478	483	483
04/22/97	287	275	280	280	04/22/97	985	968	973	973	04/22/97	492	480	486	486
04/23/97	295	289	289	289	04/23/97	985	967	972	972	04/23/97	497	485	491	491
04/24/97	286	277	278	278	04/24/97	987	975	978	978	04/24/97	496	479	489	489
04/25/97	277	266	271	271	04/25/97	970	959	961	961	04/25/97	486	471	479	479
04/26/97	279	265	273	273	04/26/97	973	956	959	959	04/26/97	492	479	477	477
04/27/97	293	277	285	285	04/27/97	981	967	972	972	04/27/97	497	483	490	490
04/28/97	291	280	283	283	04/28/97	982	967	972	972	04/28/97	495	483	489	489
04/29/97	280	271	274	274	04/29/97	976	967	968	968	04/29/97	491	478	483	483
04/30/97	272	270	270	270	04/30/97	973	967	967	967	04/30/97	486	478	482	482

4H4 Steam Flow 10/96 through 9/97					Schobers Steam Flow 10/96 through 9/97					Devils Kitchen Steam Flow 10/96 through 9/97				
DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h	DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h	DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h
05/01/97	288	282	275	283	05/01/97	981	979	970	973	05/01/97	492	483	487	487
05/02/97	282	275	270	275	05/02/97	979	973	967	970	05/02/97	491	479	485	485
05/03/97	282	270	274	275	05/03/97	973	964	964	965	05/03/97	487	478	482	482
05/04/97	282	271	279	279	05/04/97	973	964	964	965	05/04/97	491	478	485	485
05/05/97	285	275	275	279	05/05/97	973	962	962	964	05/05/97	491	479	485	485
05/06/97	287	280	280	280	05/06/97	974	961	961	965	05/06/97	492	480	486	486
05/07/97	280	281	279	279	05/07/97	971	962	962	964	05/07/97	490	479	485	485
05/08/97	282	275	278	278	05/08/97	976	962	962	965	05/08/97	488	478	483	483
05/09/97	282	275	276	276	05/09/97	973	964	964	965	05/09/97	486	478	482	482
05/10/97	286	275	279	279	05/10/97	971	964	964	964	05/10/97	490	477	484	484
05/11/97	291	280	283	283	05/11/97	973	962	962	965	05/11/97	491	479	485	485
05/12/97	288	284	284	284	05/12/97	973	962	962	965	05/12/97	490	479	484	484
05/13/97	290	282	282	284	05/13/97	973	965	964	964	05/13/97	491	479	491	491
05/14/97	282	281	280	280	05/14/97	971	964	964	965	05/14/97	490	479	485	485
05/15/97	283	275	275	278	05/15/97	974	958	958	967	05/15/97	491	478	485	485
05/16/97	277	275	275	283	05/16/97	967	953	953	959	05/16/97	486	476	481	481
05/17/97	288	280	285	283	05/17/97	967	954	954	956	05/17/97	495	476	484	484
05/18/97	287	285	285	285	05/18/97	970	954	954	959	05/18/97	491	480	486	486
05/19/97	287	284	284	283	05/19/97	968	954	954	958	05/19/97	489	479	484	484
05/20/97	288	283	283	284	05/20/97	967	954	954	959	05/20/97	486	479	487	487
05/21/97	278	280	278	278	05/21/97	960	951	951	953	05/21/97	486	478	482	482
05/22/97	282	281	281	281	05/22/97	973	944	944	956	05/22/97	492	476	484	484
05/23/97	295	285	285	289	05/23/97	960	951	951	953	05/23/97	491	478	485	485
05/24/97	288	286	286	286	05/24/97	957	936	936	944	05/24/97	490	479	485	485
05/25/97	287	282	282	284	05/25/97	941	933	933	934	05/25/97	490	476	483	483
05/26/97	281	280	280	280	05/26/97	951	936	936	940	05/26/97	488	477	483	483
05/27/97	274	263	268	268	05/27/97	948	936	936	940	05/27/97	485	471	479	479
05/28/97	282	274	274	277	05/28/97	954	948	948	945	05/28/97	485	472	479	479
05/29/97	291	282	282	284	05/29/97	948	936	936	939	05/29/97	492	477	484	484
05/30/97	292	285	285	288	05/30/97	954	939	939	944	05/30/97	492	479	485	485
05/31/97	287	282	282	284	05/31/97	951	936	936	940	05/31/97	487	477	482	482
06/01/97	291	280	280	284	06/01/97	948	933	933	938	06/01/97	491	475	483	483
06/02/97	296	285	285	290	06/02/97	948	936	936	939	06/02/97	492	478	485	485
06/03/97	292	290	290	290	06/03/97	945	936	936	937	06/03/97	491	479	485	485
06/04/97	288	284	284	283	06/04/97	941	933	933	934	06/04/97	489	477	483	483
06/05/97	287	275	280	280	06/05/97	941	933	933	934	06/05/97	486	472	479	479
06/06/97	299	288	288	292	06/06/97	941	928	928	931	06/06/97	491	467	479	479
06/07/97	291	285	285	287	06/07/97	951	929	929	937	06/07/97	485	467	476	476
06/08/97	283	280	280	281	06/08/97	945	936	936	937	06/08/97	482	472	478	478
06/09/97	282	280	280	280	06/09/97	945	936	936	937	06/09/97	485	472	479	479
06/10/97	283	275	278	278	06/10/97	941	933	933	934	06/10/97	482	471	477	477
06/11/97	282	275	275	278	06/11/97	941	933	933	934	06/11/97	480	471	475	475
06/12/97	285	280	280	281	06/12/97	941	933	933	934	06/12/97	490	472	481	481
06/13/97	303	287	287	292	06/13/97	954	936	936	942	06/13/97	493	478	486	486
06/14/97	282	270	270	275	06/14/97	941	923	923	929	06/14/97	491	467	479	479
06/15/97	272	272	272	271	06/15/97	938	929	929	931	06/15/97	480	466	473	473
06/16/97	280	273	273	274	06/16/97	940	922	922	928	06/16/97	478	464	471	471
06/17/97	282	275	275	278	06/17/97	941	931	931	933	06/17/97	480	467	474	474
06/18/97	287	276	276	282	06/18/97	943	933	933	934	06/18/97	480	470	474	474
06/19/97	292	275	283	283	06/19/97	954	920	920	934	06/19/97	490	472	481	481
06/20/97	302	285	285	293	06/20/97	976	951	951	959	06/20/97	491	474	482	482
06/21/97	297	285	290	290	06/21/97	989	976	976	979	06/21/97	494	478	486	486
06/22/97	293	284	284	283	06/22/97	973	951	951	959	06/22/97	491	477	484	484

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4H4 Steam Flow 10/96 through 9/97					Schobers Steam Flow 10/96 through 9/97					Devils Kitchen Steam Flow 10/96 through 9/97				
DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h	DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h	DATE	High, lb/h	Low, lb/h	Avg, lb/h	lb/h
06/23/97	291	278	278	278	06/23/97	941	920	928	928	06/23/97	490	474	482	474
06/24/97	282	270	270	275	06/24/97	910	889	897	897	06/24/97	490	470	479	479
06/25/97	282	270	270	275	06/25/97	919	892	903	903	06/25/97	485	468	477	477
06/26/97	286	280	280	282	06/26/97	926	905	912	912	06/26/97	482	468	475	475
06/27/97	288	275	281	281	06/27/97	926	908	914	914	06/27/97	484	467	475	475
06/28/97	287	275	280	280	06/28/97	926	911	915	915	06/28/97	480	467	473	473
06/29/97	291	277	283	283	06/29/97	923	905	911	911	06/29/97	483	467	475	475
06/30/97	292	280	285	285	06/30/97	929	908	915	915	06/30/97	489	467	478	478
07/01/97	287	276	281	281	07/01/97	926	911	915	915	07/01/97	478	456	467	467
07/02/97	282	262	271	271	07/02/97	916	905	908	908	07/02/97	481	455	468	468
07/03/97	285	275	279	279	07/03/97	923	901	909	909	07/03/97	483	468	475	475
07/04/97	287	276	280	280	07/04/97	926	905	912	912	07/04/97	485	467	476	476
07/05/97	287	275	280	280	07/05/97	923	908	914	914	07/05/97	485	467	476	476
07/06/97	291	277	281	281	07/06/97	926	905	912	912	07/06/97	485	467	476	476
07/07/97	291	275	280	280	07/07/97	926	905	912	912	07/07/97	484	468	476	476
07/08/97	288	275	283	283	07/08/97	918	905	909	909	07/08/97	481	468	474	474
07/09/97	287	279	282	282	07/09/97	913	901	905	905	07/09/97	481	466	473	473
07/10/97	286	275	280	280	07/10/97					07/10/97	491	472	482	482
07/11/97	292	275	283	283	07/11/97					07/11/97	494	478	486	486
07/12/97	302	290	295	295	07/12/97					07/12/97	491	472	482	482
07/13/97	297	289	292	292	07/13/97					07/13/97	485	467	475	475
07/14/97	282	280	280	280	07/14/97					07/14/97	485	467	476	476
07/15/97	277	270	273	273	07/15/97					07/15/97	491	477	484	484
07/16/97	272	264	262	262	07/16/97					07/16/97	490	476	483	483
07/17/97	276	264	269	269	07/17/97	926	901	911	911	07/17/97	490	474	482	482
07/18/97	293	286	289	289	07/18/97	926	917	919	919	07/18/97	485	472	479	479
07/19/97	297	281	288	288	07/19/97	926	917	919	919	07/19/97	485	468	477	477
07/20/97	288	285	286	286	07/20/97	926	917	919	919	07/20/97	486	467	474	474
07/21/97	287	279	282	282	07/21/97	926	914	917	917	07/21/97	485	468	474	474
07/22/97	286	276	280	280	07/22/97	926	914	917	917	07/22/97	481	468	474	474
07/23/97	282	275	278	278	07/23/97	923	901	909	909	07/23/97	475	460	467	467
07/24/97	277	266	271	271	07/24/97	919	903	908	908	07/24/97	483	468	475	475
07/25/97	288	280	283	283	07/25/97	924	889	903	903	07/25/97	484	471	478	478
07/26/97	293	280	286	286	07/26/97	923	908	914	914	07/26/97	481	472	477	477
07/27/97	297	290	293	293	07/27/97	923	905	911	911	07/27/97	482	472	477	477
07/28/97	297	289	292	292	07/28/97	919	905	909	909	07/28/97	481	471	476	476
07/29/97	297	285	290	290	07/29/97	913	901	905	905	07/29/97	482	472	477	477
07/30/97	292	285	288	288	07/30/97	910	901	903	903	07/30/97	478	468	473	473
07/31/97	292	285	288	288	07/31/97	918	901	908	908	07/31/97	483	472	478	478
08/01/97	291	283	286	286	08/01/97	910	895	900	900	08/01/97	484	469	477	477
08/02/97	288	279	280	280	08/02/97	910	901	903	903	08/02/97	482	471	477	477
08/03/97	292	280	285	285	08/03/97	913	901	905	905	08/03/97	483	471	477	477
08/04/97	296	285	290	290	08/04/97	913	905	906	906	08/04/97	485	472	479	479
08/05/97	292	285	288	288	08/05/97	916	901	906	906	08/05/97	480	470	475	475
08/06/97	292	280	285	285	08/06/97	913	905	906	906	08/06/97	482	471	477	477
08/07/97	294	281	287	287	08/07/97	913	901	905	905	08/07/97	491	470	481	481
08/08/97	297	276	286	286	08/08/97	926	908	914	914	08/08/97	490	477	484	484
08/09/97	298	290	293	293	08/09/97	923	908	912	912	08/09/97	492	477	485	485
08/10/97	297	289	292	292	08/10/97	923	905	911	911	08/10/97	491	472	482	482
08/11/97	297	285	290	290	08/11/97	926	905	912	912	08/11/97	490	472	481	481
08/12/97	290	280	284	284	08/12/97	926	908	914	914	08/12/97	485	468	477	477
08/13/97	287	280	283	283	08/13/97	923	911	914	914	08/13/97	484	471	478	478
08/14/97	284	280	281	281	08/14/97	926	905	912	912	08/14/97	486	468	477	477

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4H4 Steam Flow 10/96 through 9/97					Schobers Steam Flow 10/96 through 9/97					Devils Kitchen Steam Flow 10/96 through 9/97				
DATE	High, lb/h	Low, lb/h	Avg, lb/h		DATE	High, lb/h	Low, lb/h	Avg, lb/h		DATE	High, lb/h	Low, lb/h	Avg, lb/h	
08/15/97	297	285	290		08/15/97	926	905	912		08/15/97	491	472	482	
08/16/97	306	287	292		08/16/97	932	920	923		08/16/97	491	475	483	
08/17/97	292	285	288		08/17/97	929	920	922		08/17/97	488	472	482	
08/18/97	287	276	281		08/18/97	932	917	922		08/18/97	485	468	477	
08/19/97	288	276	282		08/19/97	929	917	920		08/19/97	486	468	477	
08/20/97	287	280	283		08/20/97	929	917	920		08/20/97	486	470	478	
08/21/97	292	280	285		08/21/97	929	920	922		08/21/97	490	472	481	
08/22/97	287	281	280		08/22/97	932	920	922		08/22/97	485	468	477	
08/23/97	289	284	284		08/23/97	932	920	923		08/23/97	490	472	481	
08/24/97	293	285	288		08/24/97	932	920	923		08/24/97	491	472	482	
08/25/97	292	285	288		08/25/97	932	920	923		08/25/97	490	474	482	
08/26/97	293	282	288		08/26/97	932	873	923		08/26/97	490	474	482	
08/27/97	291	275	286		08/27/97	935	889	925		08/27/97	488	473	481	
08/28/97	296	284	285		08/28/97	910	929	900		08/28/97	527	495	507	
08/29/97	297	284	290		08/29/97	918	936	908		08/29/97	532	512	522	
08/30/97	292	281	287		08/30/97	941	944	933		08/30/97	529	511	521	
08/31/97	293	285	287		08/31/97	941	944	933		08/31/97	529	511	521	
09/01/97	297	280	290		09/01/97	957	917	944		09/01/97	526	507	516	
09/02/97	288	270	283		09/02/97	957	908	947		09/02/97	526	507	516	
09/03/97	277	272	274		09/03/97	941	920	926		09/03/97	525	508	516	
09/04/97	282	275	273		09/04/97	926	909	914		09/04/97	520	505	513	
09/05/97	289	275	278		09/05/97	929	920	922		09/05/97	525	512	518	
09/06/97	289	275	280		09/06/97	926	920	917		09/06/97	520	508	514	
09/07/97					09/07/97	935	920	925		09/07/97	520	511	516	
09/08/97					09/08/97	940	920	926		09/08/97	525	511	516	
09/09/97					09/09/97	932	920	923		09/09/97	520	511	516	
09/10/97					09/10/97	938	920	926		09/10/97	520	511	519	
09/11/97	281	281	288		09/11/97	941	920	928		09/11/97	529	509	523	
09/12/97	290	285	295		09/12/97	935	920	925		09/12/97	530	517	518	
09/13/97	291	285	287		09/13/97	935	920	925		09/13/97	525	511	509	
09/14/97	283	280	281		09/14/97	929	920	922		09/14/97	523	508	513	
09/15/97	283	271	276		09/15/97	935	920	925		09/15/97	522	505	513	
09/16/97	287	275	280		09/16/97	935	920	925		09/16/97	526	501	513	
09/17/97	284	276	279		09/17/97	935	920	925		09/17/97	519	507	513	
09/18/97	292	280	284		09/18/97	934	923	925		09/18/97	536	518	525	
09/19/97	297	290	293		09/19/97	938	923	928		09/19/97	530	515	522	
09/20/97	290	282	284		09/20/97	926	919	920		09/20/97	524	509	517	
09/21/97	287	275	280		09/21/97	941	928	931		09/21/97	531	512	521	
09/22/97	273	265	268		09/22/97	938	928	931		09/22/97	527	512	519	
09/23/97	275	265	269		09/23/97	941	928	931		09/23/97	529	513	521	
09/24/97	283	274	276		09/24/97	943	929	933		09/24/97	530	515	521	
09/25/97	292	279	284		09/25/97	934	922	925		09/25/97	535	517	526	
09/26/97	298	291	294		09/26/97	923	914	915		09/26/97	531	516	523	
09/27/97	293	271	279		09/27/97	926	919	917		09/27/97	529	512	520	
09/28/97	288	281	286		09/28/97	929	920	922		09/28/97	532	518	524	
09/29/97	287	276	281		09/29/97	930	920	923		09/29/97	532	527	527	
09/30/97	295	279	285		09/30/97	926	920	920		09/30/97	530	520	525	